"LAPAROSCOPIC MESH REPAIR OF INGUINAL HERNIA AND LICHTENSTEIN'S TENSION FREE MESH REPAIR OF INGUINAL HERNIA – A COMPARATIVE STUDY" IN GMKMCH,SALEM

By

Dr.R.SURESH KUMAR.

DISSERTATION SUBMITTED TO

THE TAMILNADU Dr. M.G.R. MEDICAL UNIVERSITY, TAMILNADU

IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF

MASTER OF SURGERY

In

GENERAL SURGERY

Under the guidance of

Dr.G.RAJ ASHOK.MS., ASSOCIATE PROF.

Department of General Surgery

Government Mohan Kumaramangalam Medical college Hospital,

Salem

Year: 2015-2018.

GOVERNMENT MOHAN KUMARAMANGALAM MEDICAL COLLEGE HOSPITAL.

DECLARATION BY THE CANDIDATE

I hereby declare that this dissertation titled **" LAPAROSCOPIC MESH REPAIR OF INGUINAL HERNIA AND LICHTENSTEIN'S TENSION FREE MESH REPAIR OF INGUINAL HERNIA – A COMPARATIVE STUDY IN GMKMCH,SALEM"** is a bonafide and genuine research work carried out by me under the guidance of **Dr.G.RAJASHOK.MS.,Associate Professor**,Department of General surgery, Government Mohan Kumaramangalam Medical College Hospital, Salem, Tamil Nadu, India.

Signature of the Candidate

Place: Salem

DR. R.SURESH KUMAR

GOVERNMENT MOHAN KUMARAMANGALAM MEDICAL COLLEGE HOSPITAL.

CERTIFICATE BY THE GUIDE

This is to certify that this dissertation **"LAPAROSCOPIC MESH REPAIR OF INGUINAL HERNIA AND LICHTENSTEIN'S TENSION FREE MESH REPAIR OF INGUINAL HERNIA – A COMPARATIVE STUDY IN GMKMCH,SALEM"** is a bonafide work done by **Dr.R.SURESH KUMAR** in partial fulfillment of the requirement for the degree of M. S. in General Surgery, examination to be held in 2018.

Signature of the Guide

Dr. G.RAJ ASHOK.M.S.,

Place: Salem

Associate Professor ,
Department of General Surgery,
Government Mohan Kumaramangalam
Medical College Hospital,
Salem, Tamil Nadu.

GOVERNMENT MOHAN KUMARAMANGALAM MEDICAL COLLEGE HOSPITAL.

ENDORSEMENT BY THE HEAD OF DEPARTMENT

This is to certify that this dissertation titled **"LAPAROSCOPIC MESH REPAIR OF INGUINAL HERNIA AND LICHTENSTEIN'S TENSION FREE MESH REPAIR OF INGUINAL HERNIA – A COMPARATIVE STUDY IN GMKMCH,SALEM"** is a bonafide work done by **Dr.R.SURESH KUMAR** under the overall guidance and supervision of **Dr.C.RAJASEKARAN .M.S., Professor and Head**, Department of General Surgery, Government Mohan Kumaramangalam Medical College Hospital, in partial fulfillment of the requirement for the degree of M. S. in General Surgery, examination to be held in 2018.

Seal & Signature of the HOD

Dr.C.RAJASEKARAN.M.S
Professor and Head
Department of General Surgery
Government Mohan Kumaramangalam Medical College Hospital
Salem, Tamil Nadu, India

GOVERNMENT MOHAN KUMARAMANGALAM MEDICAL COLLEGE HOSPITAL.

ENDORSEMENT BY THE DEAN OF THE INSTITUTION

This is to certify that this dissertation entitled **"LAPAROSCOPIC MESH REPAIR OF INGUINAL HERNIA AND LICHTENSTEIN'S TENSION FREE MESH REPAIR OF INGUINAL HERNIA – A COMPARATIVE STUDY IN GMKMCH,SALEM"** is a bonafide work done by **Dr.R.SURESH KUMAR** under overall guidance and supervision of **Dr.C.RAJASEKARAN.M.S.,** Professor and Head, Department of General Surgery, Government Mohan Kumaramangalam Medical College Hospital, in partial fulfillment of the requirement for the degree of M. S. in General Surgery, examination to be held in 2018.

Seal & Signature of the Dean

Dean
Government Mohan Kumaramangalam Medical College and Hospital
Salem, Tamil Nadu, India

GOVERNMENT MOHAN KUMARAMANGALAM MEDICAL COLLEGE HOSPITAL.

COPYRIGHT

I hereby declare that the Government Mohan Kumaramangalam Medical College Hospital, Salem, Tamil Nadu, India; shall have the rights to preserve, use and disseminate this dissertation / thesis in print or electronic format for academic / research purpose.

October 2017 *Signature of the Candidate*

Place: Salem **DR. R.SURESH KUMAR**

43
13/1/16

Ref. No.6027/MEI/2015

Office of the Dean,
Govt. Mohan Kumaramangalam
Medical College, Salem – 30.

Dated: 06 .01.2016.

Ethical Committee Meeting held on 23.12.2015 at 11.00 A.M in the Seminar Hall, IInd Floor, Medicine Block, Govt. Mohan Kumaramangalam Medical College Hospital, Salem - 01.

Name of the Presenter with Address	Title	Name of the Guide and Address	Whether it is Approved or not.
Dr.R. Sureshkumar, I Year, Post Graduate Student of MS (General Surgery), GMKMC, Salem-30.	"Laparoscopic Mesh Repair of Inguinal Hernia And Lichtenstein's Tension Free Mesh Repair of Inguinal Hernia – A Comparitive Study."	Dr.V.Lekshmi Narayani, MS., D.G.O, Professor of General Surgery, GMKMC, Salem.	Approved

The Ethical Committee examined the studies in detail and is pleased to accord Ethical Committee approval for the above Post Graduate student of this College to carry out the studies with the following conditions.

1. He should carry out the work without detrimental to regular activities as well as without extra expenditure to the institution to Government.
2. He should inform the institution Ethical Committee in case of any change of study procedure site and investigation or guide.
3. He should not deviate from the area of the work for which applied for Ethical clearance. He should inform the IEC immediately, in case of any adverse events or serious adverse reactions.
4. He should abide to the rules and regulations of the Institution.
5. He should complete the work within the specific period and if any extension of time is required he should apply for permission again and do the work.
6. He should submit the summary of the work to the Ethical Committee on completion of the work.
7. He should not claim any funds from the institution while doing the work or on completion.
8. He should understand that the members of IEC have the rights to monitor the work with prior intimation.

— Forwarded to Dr. R. Sureshkumar —

10/01/16

Prof. Dr. C. RAJASEKARAN, M.S., (Gen. Surgery)
Reg. No: 41210, Chief Civil Surgeon,
Professor & HOD of General Surgery,
Govt. Mohan Kumaramangalam Medical
College & Hospital, SALEM-636 001.

DEAN

To
The Individual.

6/1/16

URKUND

Urkund Analysis Result

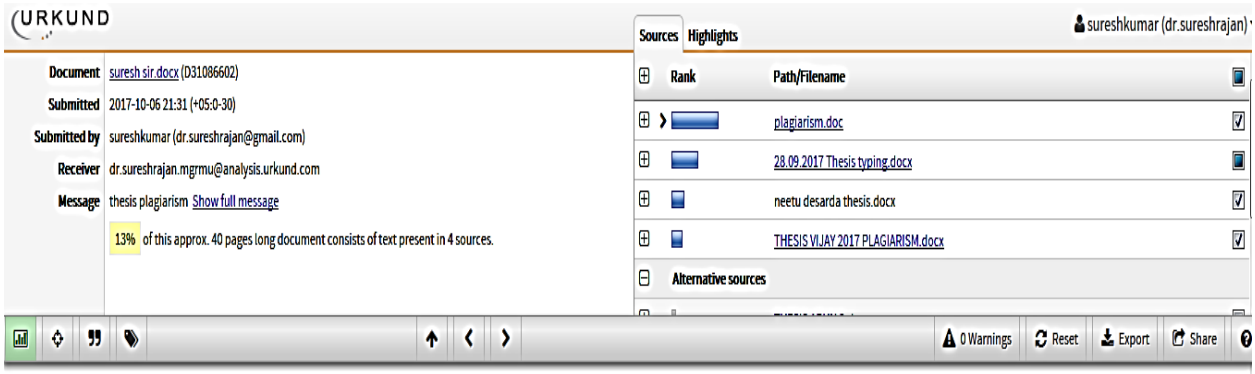
Analysed Document: suresh sir.docx (D31086602)
Submitted: 10/6/2017 6:01:00 PM
Submitted By: dr.sureshrajan@gmail.com
Significance: 13 %

Sources included in the report:

neetu desarda thesis.docx (D30374706)
28.09.2017 Thesis typing.docx (D30912879)
plagiarism.doc (D31068720)
THESIS VIJAY 2017 PLAGIARISM.docx (D31074209)

Instances where selected sources appear:

35


URKUND
sureshkumar (dr.sureshrajan)
Sources
Highlights
Document
suresh sir.docx (D31086602)
Submitted
2017-10-06 21:31 (+05:0-30)
Submitted by
sureshkumar (dr.sureshrajan@gmail.com)
Receiver
dr.sureshrajan.mgrmu@analysis.urkund.com
Message
thesis plagiarism Show full message
13% of this approx. 40 pages long document consists of text present in 4 sources.
Rank
Path/Filename
plagiarism.doc
28.09.2017 Thesis typing.docx
neetu desarda thesis.docx
THESIS VIJAY 2017 PLAGIARISM.docx
Alternative sources
0 Warnings
Reset
Export
Share

ACKNOWLEDGMENTS

I am extremely thankful to **Prof. Dr.P.KANAGARAJ. MD.,** Dean, Government Mohan Kumaramangalam Medical College Salem, for allowing me to utilize the hospital facilities for doing this work.

I am indebted to **Dr.G.RAJ ASHOK.**,MS.,Chief Surgical unit S-IV, Department of General Surgery, GMKMCH, Salem, who was my guide in this work and also my revered teacher. I remain ever grateful to him for his encouragement, guidance, and patience throughout my post graduate career.

I am grateful to **Prof. Dr.C.RAJASEKARAN.MS.**, Professor and Head, Department of General Surgery, Government Mohan Kumaramangalam Medical College Hospital, for his fathomless enthusiasm and motivation throughout the study.

I express my sincere thanks **to Dr. V.LEKSHMI NARAYINI D.G.O .,M.S.**, **Dr.K.VIJAYAKUMAR.,M.S.**, **Dr.K.KESAVALINGAM.,M.S., Dr.P.SUMATHI ,D.G.O, M.S., Dr.M.RAJASEKAR.,M.S,** for all their help and guidance during my post graduate study period.

My gratitude to **Dr .M. ARUL KUMARAN.,M.S.,** Registrar, Department of General Surgery for his guidance in completing the study.

I would like to express my thanks to **Dr.N.Jeeva M.S., Dr.P.Kannan M.S., Dr.A.Sundarambal., M.S, Dr.N.Muthusamy M.S., Dr.T.Manikandan M.S., Dr.P.Thiyagarajan M.S., Dr.A.Manoharan M.S., Dr.S.Selvaraj M.S.,** the assistant professors of my surgical unit, for their relentless encouragement during the period of this study. Their enthusiasm in teaching me and their immense encouragement have been responsible for easing out many shortcomings during this work.

I would like to thank all the assistant professors in the department of General Surgery for their immense help and guidance during my post-graduation course.

I would like to acknowledge **Mr.S. Venkatesan**, for helping me to analyze and compile the statistical data for my study.

I specially thank all my patients without whose cooperation; this dissertation would never have seen the light of the day.

I am always indebted to my family and all my friends, without whose co-operation and understanding during the trying times, this work would not have been possible

Dr.R.SURESH KUMAR.

ABSTRACT

Hernia is an abnormal protrusion of apart or whole of the viscous through an abnormal opening in the wall of the cavity which it contains. Inguinal hernias are being the most common external hernias accounting for 70-75%.

Successful and effective management of inguinal hernias has always a challenge to surgeons in spite of various advancements in medicine and various surgical techniques.

AIM AND OBJECTIVES:

To compare the several parameters between the two methods of inguinal hernia mesh repair , namely Lichtenstein's method and Laparoscopic inguinal hernia repair .

MATERIALS AND METHODS :

The prospective study of 80 cases of inguinal hernia admitted in Government Mohan Kumaramangalam Medical College Hospital, Salem was done in the period from Jan 2016 to Sep 2017,40 were operated by Lichtenstein's inguinal hernia mesh repair and 40 cases were operated with Laparoscopic inguinal hernia repair . The cases were evaluated through proper history taking, clinical examination, operative procedure and post operative follow ups.

OBSERVATION :

In this study the mean duration of operation for Lichtenstein's repair was 51 minutes and for Laparoscopic repair it was 81 minutes, intra operative complications were 5% in Lichtenstein's repair (vascular injury) and in Laparoscopic repair it was nil.

Post operative complications in laparoscopic repair was port site infection-2.5%,seroma collection-2.5%,in Lichtenstein's repair the seroma collection-8.8%,wound infection-3.8% the post operative pain was more with Lichtenstein's repair than Laparoscopic repair. The duration of stay in hospital was 4 days for Laparoscopic repair and for Lichtenstein's repair it was 7 days, the recurrence rate Lichtenstein's repair and nil recurrence with Laparoscopic repair. The return to daily activities was 7 days in Laparoscopic repair, in Lichtenstein's repair it was 15 days. The patient's feedback was good with Laparoscopic repair compared to Lichtenstein's repair.

CONCLUSION:

The laparoscopic repair of inguinal hernia is associated with faster recovery, less pain, less post operative complications and earlier return to daily activities than Lichtenstein's inguinal hernia mesh repair.

Keyword: Inguinal hernias, Pain, Laparoscopy, Mesh repair, Lichtenstein's repair.

TABLE OF CONTENTS

SL. NO.	CONTENTS	PAGE NO.
1.	INTRODUCTION	1
2.	AIMS AND OBJECTIVES	5
3.	MATERIALS AND METHODS	6
4.	REVIEW OF LITERATURE	9
5.	OBSERVATION AND RESULTS	81
6.	DISCUSSION	99
7.	CONCLUSION	103
8.	**ANNEXURES** BIBLIOGRAPHY PROFORMA PATIENT CONSENT FORM MASTERCHART	

LIST OF FIGURES

FIG. NO.	PICTURES.	PAGE NO.
1.	ANATOMY OF INGUINAL CANAL	11
2.	INGUINAL LIGAMENT AND ITS REFLECTIONS	13
3.	HESSELBACH'S TRIANGLE	14
4.	VIEW OF INGUINAL AND FEMORAL HERNIAS	15
5.	MYOPECTINEAL ORIFICE OF FRUCHAUD	16
6.	VESSELS IN INGUINAL REGION	17
7.	NERVES OF INGUINAL REGION	18
8.	LAPROSCOPIC ANATOMY OF INGUINAL REGION	19
9.	TRIANGLES IN LAPAROSCOPIC REPAIR	20
10.	TRIANGLE OF DOOM	21
11.	TRIANGLE OF PAIN	21
12.	LICHTENSTEIN'S INGUINAL HERNIA REPAIR	
12.a	INCISION IN INGUINAL HERNIA	47
12.b	INCISION EXPOSING EXTERNAL OBLIQUE APONEUROSIS	47
12.c	INCISION EXPOSING NERVES	48

FIG. NO.	PICTURES.	PAGE NO.
12.d	HERNIAL SAC EXPOSED	49
12.e	SAC EXAMINATION	50
12.f	MESH FIXATION TO INGUINAL LIGAMENT	51
12.g	MESH FIXATION	52
12.h	SKIN CLOSURE	52
13.	LAPAROSCOPIC INGUINAL HERNIA MESH REPAIR	
13.a	POSITION OF PATIENT FOR TAPP	59
13.b	PORT PLACEMENT FOR TAPP	59
13.c	PERITONEUM REFLECTED IN TAPP	60
13.d	MESH FIXATION IN TAPP	62
13.e	PORT PLACEMENT IN TEP	64
13.f	DISSECTING BALOON CATHETER IN TEP	65
13.g	MESH FIXATION IN TEP	66
13.h	PROSTHETIC MATERIAL	67

LIST OF TABLES

FIG. NO.	TABLE	PAGE NO.
1.	CROSSTAB – COMORBIDITIES OF THE PATIENTS.	81
2.	CHI SQUARE CHART-COMORBIDITIES OF THE PATIENT	81
3.	COMORBIDITIES OF THE PATIENTS	82
4.	CROSSTAB-INTRA OPERATIVE COMPLICATIONS.	83
5.	CHI SQUARE CHART- INTRA OPERATIVE COMPLICATIONS	83
6.	INTRA OPERATIVE COMPLICATIONS	84
7.	CROSSTAB-POST OPERATIVE COMPLICATIONS	85
8.	CHI SQUARE CHART-POST OPERATIVE COMPLICATIONS	85
9.	POST OPERATIVE COMPLICATIONS	86
10.	CROSSTAB-RECURRENCE	87
11.	CHI SQUARE CHART-RECURRENCE	87
12.	RECURRENCE	88
13.	CROSSTAB- POST OPERATIVE PAIN	89
14.	CHI SQUARE CHART- POST OPERATIVE PAIN	89
15.	POST OPERATIVE PAIN	90

FIG. NO.	TABLE	PAGE NO.
16.	CROSSTAB- PATIENT FEED BACK	91
17.	CHI SQUARE CHART- PATIENT FEED BACK.	91
18.	PATIENT FEED BACK.	92
19.	T TESTS – GROUP STATISTICS	93
20.	INDEPENDANT SAMPLE TEST	94
21.	AGE DISTRIBUTION	95
22.	OPERATION PROCEDURE TIME	96
23.	DURATION OF STAY	97
24.	RETURN TO DAILY ACTIVITIES	98

LIST OF CHARTS

FIG. NO.	CHARTS	PAGE NO.
1.	COMORBIDITIES OF THE PATIENTS	82
2.	INTRA OPERATIVE COMPLICATIONS	84
3.	POST OPERATIVE COMPLICATIONS	86
4.	RECURRENCE.	88
5.	POST OPERATIVE PAIN	90
6.	PATIENT FEED BACK.	92
7.	AGE DISTRIBUTION.	95
8.	OPERATION PROCEDURE TIME	96
9.	DURATION OF STAY IN HOSPITAL	97
10.	RETURN TO DAILY ACTIVITIES	98

LIST OF ABBREVATIONS USED

1. TAPP : Trans Abdominal pre peritoneal.
2. TEP : Totally Extra Peritoneal .
3. CT : Computerised Tomogram .
4. PTFE : Poly Tetra Fluro Ethylene .
5. LGV : Lympho Granuloma Venereum .
6. USG : Ultrasonogram .
7. ASIS : Anterior Superior Iliac Spine .
8. DALY : Disability adjusted life years .
9. MRI : Magnetic Resonance Imaging.
10. LAP : laparoscopy
11. LIC : Lichtenstein
12. POP : Post Operative Pain
13. OPT : Operation Procedure Time .
14. PSI : Port Site Infection .

INTRODUCTION

One among the most commonly performed surgery by general surgeons in India is Hernia repair surgery. Despite the frequency of this procedure, no surgeon has ideal results and complications such as postoperative pain, nerve injury, infection, and recurrence remain.

Hernia is derived from the Latin word for rupture. A hernia is defined as an abnormal protrusion of an organ or tissue through a defect in its surrounding walls. Although a hernia can occur at various sites of the body, these defects most commonly involve the abdominal wall, particularly the inguinal region. Abdominal wall hernias occur only at sites at which the Aponeurosis and fascia are not covered by striated muscle. These sites most commonly include the inguinal, femoral, and umbilical areas, linear alba, lower portion of the semilunar line, and sites of prior incisions. So-called neck or orifice of a hernia is located at the innermost musculoaponeurotic layer, whereas the hernia sac is lined by peritoneum and protrudes from the neck. There is no consistent relationship between the area of a hernia defect and the size of a hernia sac.

A hernia is **reducible** when its contents can be replaced within the surrounding musculature or the wall and it is **irreducible or incarcerated** when it cannot be reduced. A **strangulated** hernia has compromised blood supply to its

contents, which is a serious and potentially fatal complication. Strangulation occurs more often in large hernias that have small orifices. In this situation, the small neck of the hernia obstructs venous drainage arterial blood flow, or both to the contents of the hernia sac. Adhesions between the contents of the hernia and peritoneal lining of the sac can provide a tethering point that entraps the hernia contents and predisposes to intestinal obstruction and strangulation. A more unusual type of strangulation is a **Richter's hernia**. In Richter's hernia, a small portion of the antimesenteric wall of the intestine is trapped within the hernia, and strangulation can occur without the presence of intestinal obstruction.

An **external hernia** protrudes through all layers of the abdominal wall, whereas an **internal hernia** is a protrusion of intestine through a defect in the peritoneal cavity. An **interparietal hernia** occurs when the hernia sac is contained within a musculoaponeurotic layer of the abdominal wall.

INGUINAL HERNIA

Inguinal hernia repair is one among the most commonly performed operation in India, owing to a significant lifetime incidence and variety of successful treatment modalities. Advancements in perioperative anaesthesia and operative technique have made this an outpatient ambulatory operation with low recurrence rates and morbidity. Given this success, quality of life and the

avoidance of chronic pain have become the most important considerations in hernia repair.

Approximately 75% of abdominal wall hernias occur in the groin. The lifetime risk of inguinal hernia is 27% in men and 3% in women .Of inguinal hernia repairs, 90% are performed in men and 10% in women. The incidence of inguinal hernias in males has a bimodal distribution, with peaks before the first year of age and after age 40. Abramson demonstrated the age dependence of inguinal hernias in 1978. Those age 25 to 34 years had a lifetime prevalence rate of 15%, whereas those age 75 years and over had a rate of 47%.Approximately 70% of **femoral hernia** repairs are performed in women; however, inguinal hernias are five times more common than femoral hernias. The most common subtype of groin hernia in men and women is the indirect inguinal hernia.

Inguinal hernias form because of a defect in the myopectineal orifice that allows intra-abdominal contents to protrude into the groin. The anatomy can be difficult to grasp, however, before performing inguinal hernioplasty, the surgeon must understand inguinal anatomy to avoid complications such as chronic pain and recurrence.

Open anterior surgical repair with mesh prosthesis was the technique of choice until the early 1990s, when the introduction of laparoscopy revolutionized

inguinal hernia repair. Benefits of the laparoscopic technique include lower incidence of chronic pain and faster return to work. The laparoscopic approach also affords significant advantages for patients with bilateral hernias, recurrent hernias previously repaired by an anterior approach, and femoral hernias. Regardless of the approach, an in depth knowledge of groin anatomy is essential to achieve a durable repair.

AIMS AND OBJECTIVES.

The objectives of my study would be to compare the following parameters between the two methods of inguinal hernia mesh repair , namely lichtenstein's method and laparoscopic inguinal hernia repair

1. Patient selection
2. Operative techniques
3. Operation procedure time
4. Intra operative complications
5. Post operative complications
6. Post operative pain
7. Duration of stay in hospital
8. Duration required to get back to normal activities
9. Recurrence
10. Cost effectiveness
11. Learning curve
12. Patient feedback

MATERIALS AND METHODS.

Title	"**LAPAROSCOPIC MESH REPAIR OF INGUINAL HERNIA AND LICHTENSTEIN'S TENSION FREE MESH REPAIR OF INGUINAL HERNIA – A COMPARATIVE STUDY"**
Aims and Objective	The objectives of my study would be to compare the following parameters between the two methods of inguinal hernia mesh repair , namely Lichtenstein's method and laparoscopic inguinal hernia repair 1. Patient selection 2. Operative techniques 3. Operation procedure time 4. Intra operative complications 5. Post-operative complications 6. Post-operative pain 7. Duration of stay in hospital 8. Duration required to get back to normal activities 9. Recurrence 10.Cost effectiveness

	11.Learning curve 12.Patient feedback
Design of the study	Non randomised comparative study Prospective study Study design : Non-randomised comparative study Sample size : for Lichtenstein's repair - 40 for laparoscopic repair – 40 Sample design : Purposive sampling Sample place : Department of general surgery, GMKMCH, Salem Study period : 2015 to 2017
Ethical clearance	Approved.
Consent	An informed consent was obtained from the patients.
Material / Selection of Subjects	80 cases of inguinal hernia

Inclusion criteria	Patient diagnosed as having inguinal hernia aged 18 years and above giving valid informed consent. Patient with unilateral or bilateral inguinal hernias.
Exclusion criteria	1.Patients with bleeding diathesis 2.Pateints with complicated inguinal hernias. 3. Age<18 years & >60 years 4.Patient with failed laparoscopic repair of inguinal hernia.
Data Collection & Methods	The material for the study is taken from the cases admitted in the surgical ward of the Department of General Surgery, GMK Medical College & Hospital, who are diagnosed to have inguinal hernia. Follow up done for a period of six months following surgery as follows: • One week after surgery. • Once a month for three months and at the end of six months after surgery.
Sample size	80This study includes 80 patients presenting with inguinal hernia.

HISTORY

Evidence of surgical repair of inguinal hernias can be traced back to ancient civilizations of Egypt and Greece. Early management of inguinal hernias often involved a conservative approach with operative management reserved only for complications. Surgery often involved routine excision of the testicle, and wounds were closed with cauterization or left to granulate on their own. Considering these procedures were performed before the advent of the aseptic technique, it is safe to assume that mortality was quite high. For those that survived the operation, recurrence of the hernia was common.

From the late 1700s to the early 1800s, physicians including Hesselbach, Cooper, Camper, Scarpa, Richter, and Gimbernat identified vital components of the inguinal region. Improved understanding of the anatomy and pathophysiology of inguinal hernias, coupled with the development of aseptic technique, led surgeons such as Marcy, Kocher, and Lucas- Championnière to perform sac dissection, high ligation, and closure of the internal ring. Outcomes improved, but recurrence rates remained high with prolonged follow-up.

Based on a comprehensive understanding of inguinal anatomy, Bassini (1844–1924) transformed inguinal hernia repair into a successful venture with minimal morbidity. The success of the Bassini repair over its predecessors ushered in an era of tissue based repairs. Modifications of the Bassini repair were manifest

in the McVay and Shouldice repairs. All three of these techniques, as well as modern variations such as the Desarda operation, are currently practiced.

In the early 1980s, Lichtenstein popularized the tension- free repair, supplanting tissue-based repairs with the widespread acceptance of prosthetic materials for inguinal floor reconstruction. This technique was superior to previous tissue-based repair in that mesh could restore the strength of the transversalis fascia, thereby avoiding tension in the defect closure. Superior results were reproducible regardless of hernia size and type, and they were achievable among expert and non-expert hernia surgeons alike.

With the advent of minimally invasive surgery, inguinal hernia repair underwent its most recent transformation. Laparoscopic inguinal hernia repair offers an alternative approach, minimizes postoperative pain, and improves recovery. Since the initial description by Ger, the laparoscopic method has become significantly more sophisticated. Refinements in approach and technique have led to the development of the intraperitoneal onlay mesh, the **transabdominal preperitoneal (TAPP) repair,** and the **totally extraperitoneal (TEP) repair**. Further, prosthetic materials have been introduced to minimize recurrence and improve quality of life. Irrespective of the approach, sucessful surgical treatment of inguinal hernia depends on sound grasp of inguinal anatomy.

ANATOMY OF INGUINAL CANAL.

The inguinal canal is an approximately 4 to 6 cm long cone shaped region situated in the anterior portion of the pelvic basin . The canal begins on the posterior abdominal wall, where the spermatic cord passes through the deep (internal) inguinal ring, a hiatus in the transversalis fascia. The canal concludes medially at the superficial (external) inguinal ring, the point at which the spermatic cord crosses a defect in the external oblique aponeurosis.

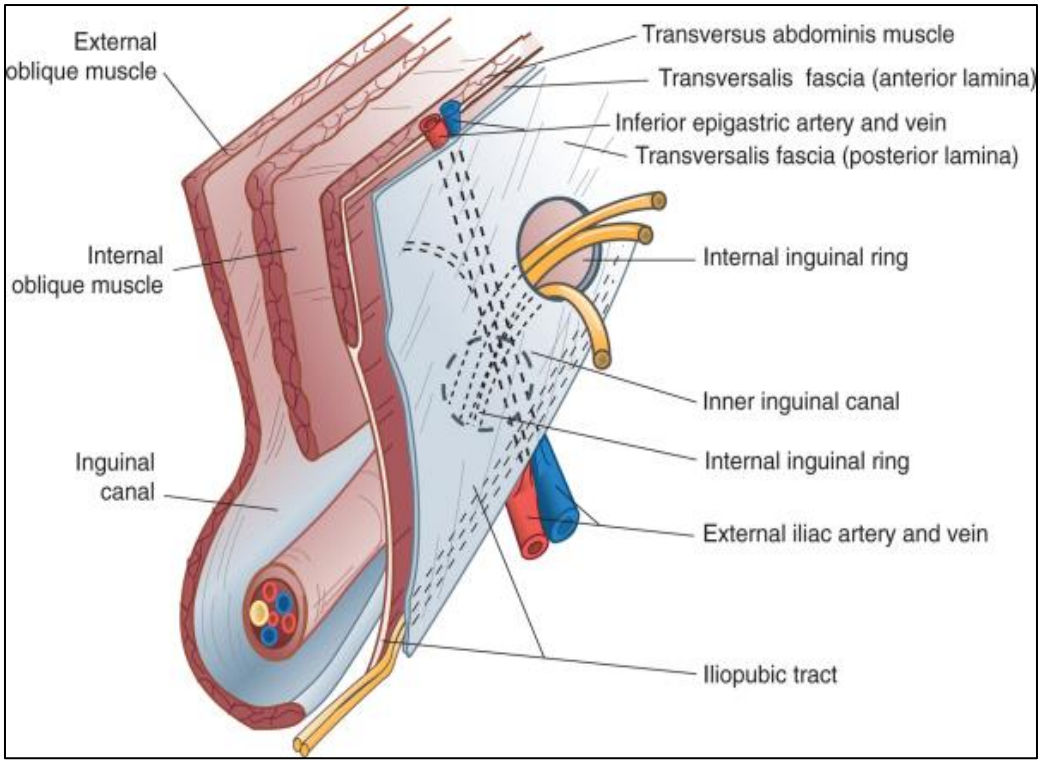


FIG- 01. ANATOMY OF INGUNAL CANAL

The boundaries of the inguinal canal are comprised of the external oblique aponeurosis anteriorly, the internal oblique muscle laterally, the transversalis fascia and transversus abdominis muscle posteriorly, the internal oblique muscle superiorly, and the inguinal (Poupart's) ligament inferiorly. The spermatic cord traverses the inguinal canal, and it contains three arteries, three veins, two nerves, the pampiniform venous plexus, and the vas deferens. It is enveloped in three layers of spermatic fascia(External spermatic fascia, cremastric muscle and Internal spermatic fascia).

Additional important structures surrounding the inguinal canal include the iliopubic tract, the lacunar ligament, Cooper's ligament, and the conjoint tendon. The **iliopubic tract** is an aponeurotic band that begins at the anterior superior iliac spine and inserts into Cooper's ligament from above. It forms on the deep inferior margin of the transversus abdominis and transversalis fascia. The shelving edge of the inguinal ligament is a structure that connects the iliopubic tract to the inguinal ligament. The iliopubic tract helps form the inferior margin of the internal inguinal ring as it courses medially, where it continues as the anteromedial border of the femoral canal. The **lacunar ligament, or ligament of Gimbernat**, is the triangular fanning of the inguinal ligament as it joins the pubic tubercle. **Cooper's (pectineal) ligament** is the lateral portion of the lacunar ligament that is fused to the periosteum of the pubic tubercle. The conjoint tendon is commonly described

as the fusion of the inferior fibres of the internal oblique and transversus abdominis aponeurosis at the point where they insert on the pubic tubercle.

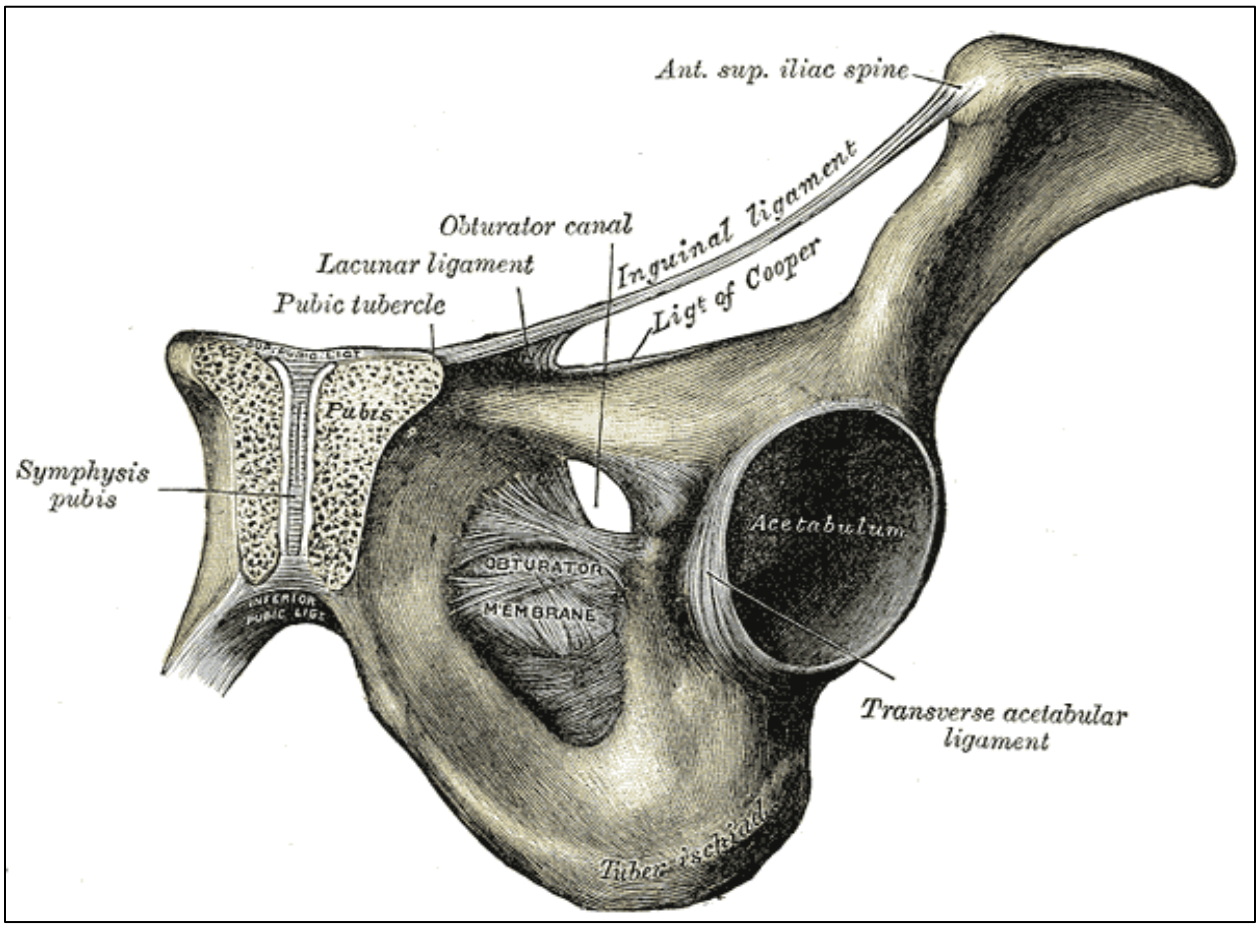


FIG 02. INGUINAL LIGAMENT AND ITS REFLECTIONS

Inguinal hernias are generally classified as **indirect, direct, and femoral** based on the site of herniation relative to surrounding structures**. Indirect hernias** protrude lateral to the inferior epigastric vessels, through the deep inguinal ring. **Direct hernias** protrude medial to the inferior epigastric vessels, within **Hesselbach's triangle**. The borders of the triangle are the inguinal ligament

inferiorly, the lateral edge of rectus sheath medially, and the inferior epigastric vessels superolaterally**.**

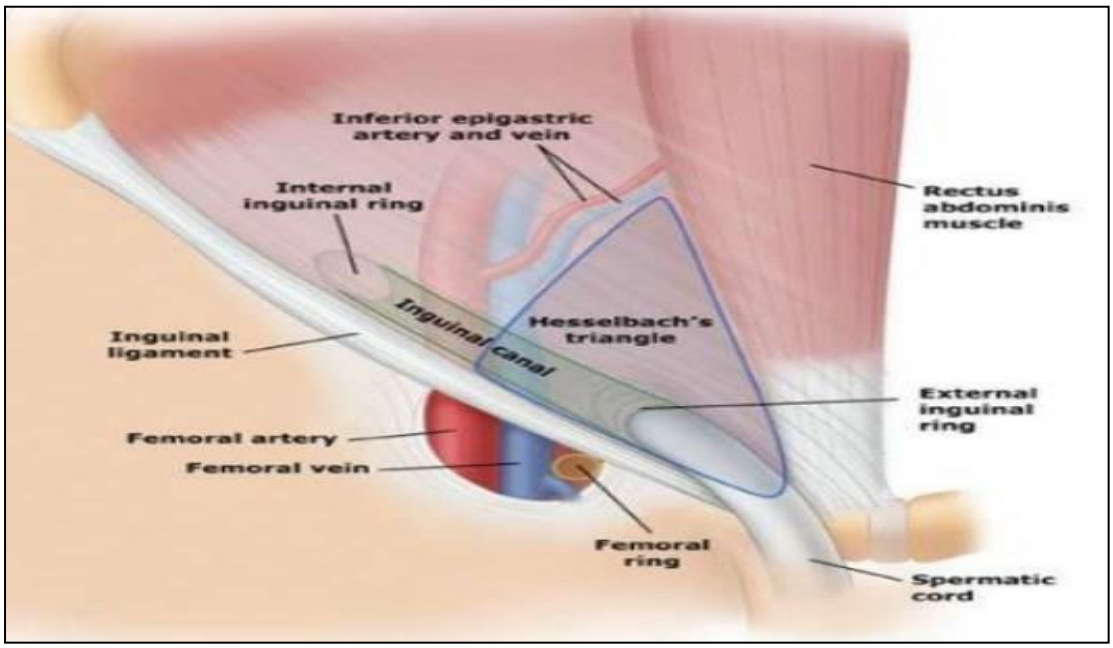


FIG-03.HESSELBACH'S TRIANGLE

Femoral hernias protrude through the small and inflexible femoral ring. The borders of the femoral ring include the iliopubic tract and inguinal ligament anteriorly, Cooper's ligament posteriorly, the lacunar ligament medially, and the femoral vein laterally.

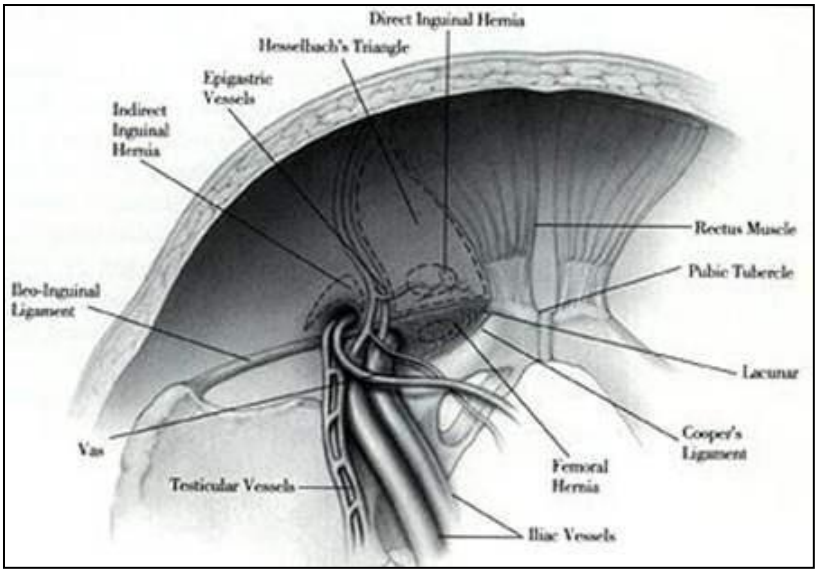


FIG-04.VIEW OF INGUINAL AND FEMORAL HERNIAS

The laparoscopic approach to hernia repair provides a posterior perspective to the peritoneal and preperitoneal spaces. Intraperitoneal points of reference are the **five peritoneal folds, bladder, inferior epigastric vessels, and psoas muscle**. Two potential spaces exist within the pre peritoneum. Between the peritoneum and the posterior lamina of the transversalis fascia is **Bogros's (preperitoneal) space.** This area contains preperitoneal fat and areolar tissue. The most medial aspect of the preperitoneal space, that which lies superior to the bladder, is known as the **space of Retzius**.

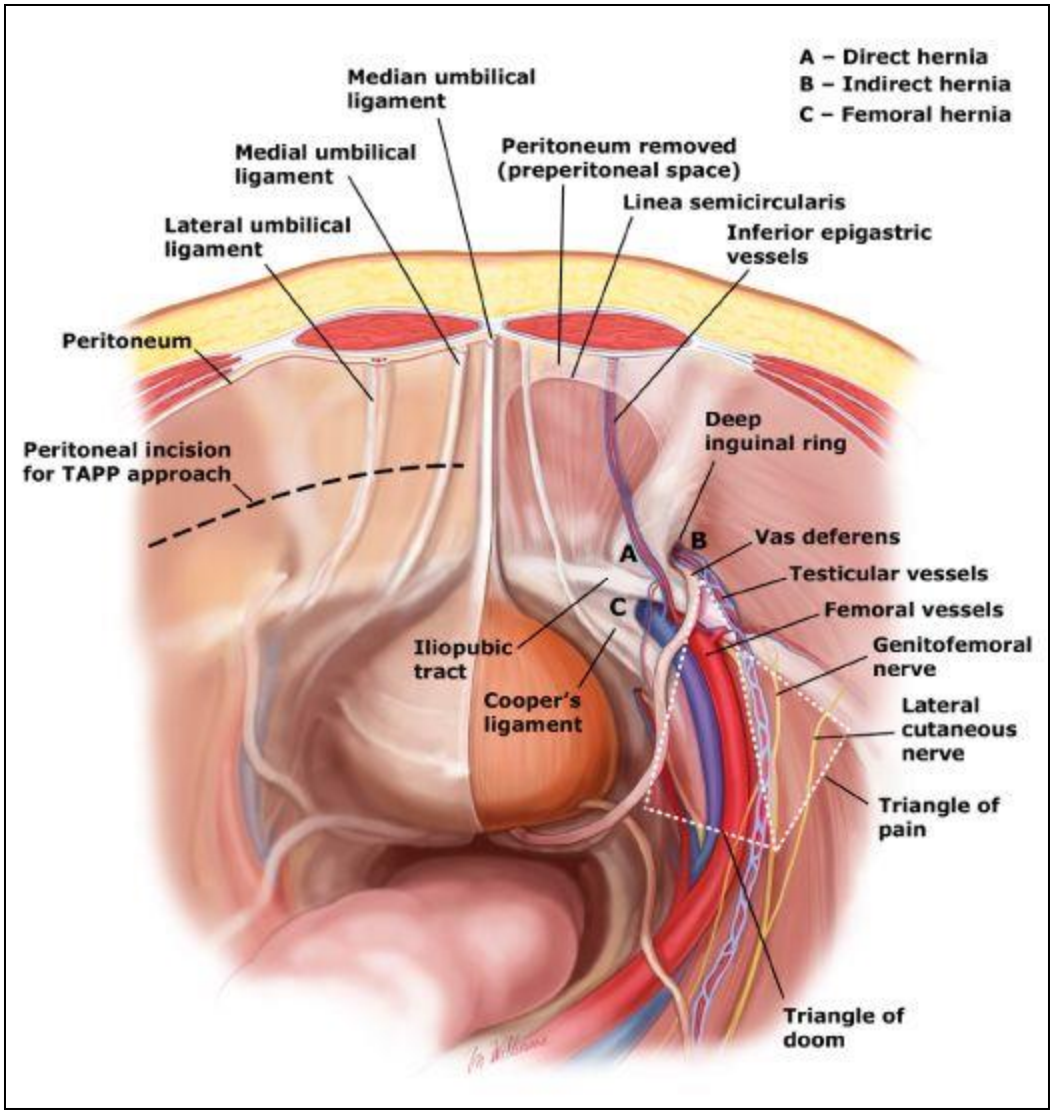


FIG-05.MYOPECTINEAL ORIFICE OF FRUCHAUD

The posterior perspective also allows visualization of the myopectineal orifice of Fruchaud, a relatively weak portion of the abdominal wall that is divided by the inguinal ligament.

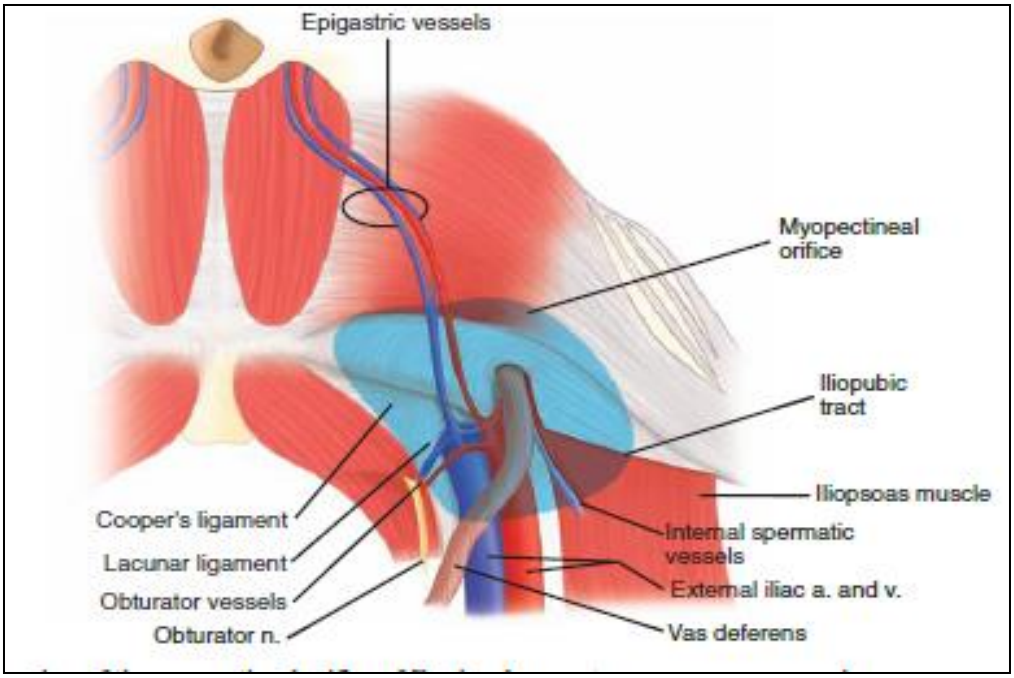


FIG-06.VESSELS IN INGUINAL REGION

The *vascular space* is situated between the posterior and anterior laminae of the transversalis fascia, and it houses the inferior epigastric vessels. The **inferior epigastric artery** supplies the rectus abdominis. It is derived from the external iliac artery, and it anastomoses with the superior epigastric, a continuation of the internal thoracic artery. The epigastric veins course parallel to the arteries within the rectus sheath, posterior to the rectus muscles. Inspection of the internal inguinal ring will reveal the deep location of the inferior epigastric vessels.

Nerves of interest in the inguinal region are **the ilioinguinal, iliohypogastric, genitofemoral, and lateral femoral cutaneous nerves**. The ilioinguinal and iliohypogastric nerves arise together from the first lumbar nerve

(L1). The **ilioinguinal nerve** emerges from the lateral border of the psoas major

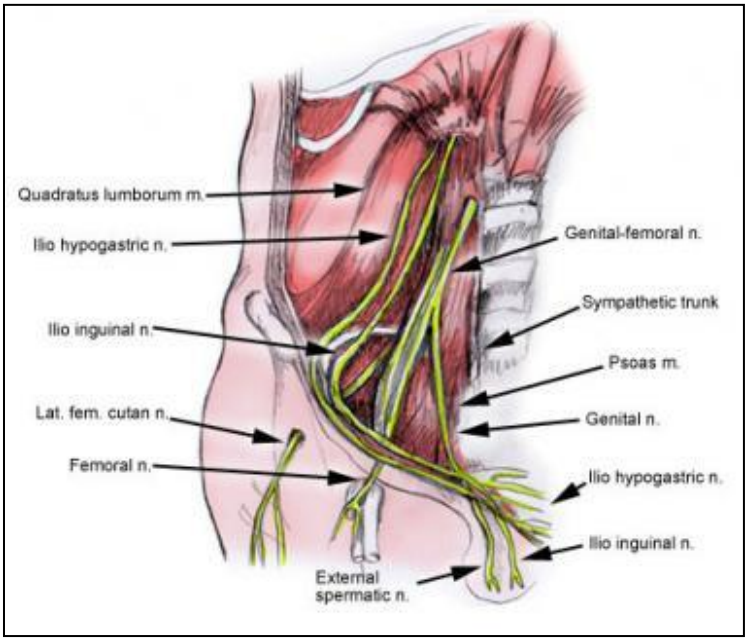


FIG-07.NERVES OF INGUINAL REGION

and passes obliquely across the quadratus lumborum. At a point just medial to the anterior superior iliac spine, it pierces the transversus and internal oblique muscles to enter the inguinal canal and exits through the superficial inguinal ring. It supplies somatic sensation to the skin of the upper and medial thigh. In males, it also innervates the base of the penis and upper scrotum. In females, it innervates the mons pubis and labium majus. The **iliohypogastric nerve** arises from T12–L1. After it pierces the deep abdominal wall, it courses between the internal oblique and transversus abdominis, supplying both. It then divides into lateral and anterior cutaneous branches. A common variant is for the iliohypogastric and ilioinguinal

nerves to exit around the superficial inguinal ring as a single entity. The **genitofemoral nerve** arises from L1–L2, courses along the retroperitoneum, and emerges on the anterior aspect of the psoas. It then divides into genital and femoral branches. The genital branch enters the inguinal canal lateral to the inferior epigastric vessels, and it courses ventral to the iliac vessels and iliopubic tract. In males, it travels through the superficial inguinal ring and supplies the ipsilateral scrotum and cremaster muscle. In females, it supplies the ipsilateral mons pubis and labium majus. The femoral branch courses along the femoral sheath, supplying the skin of the upper anterior thigh. The **lateral femoral cutaneous nerve** arises from L2–L3, emerges lateral to the psoas muscle at the level of L4, and crosses the iliacus muscle obliquely toward the anterior superior iliac spine. It then passes inferior to the inguinal ligament where it divides to supply the lateral thigh.

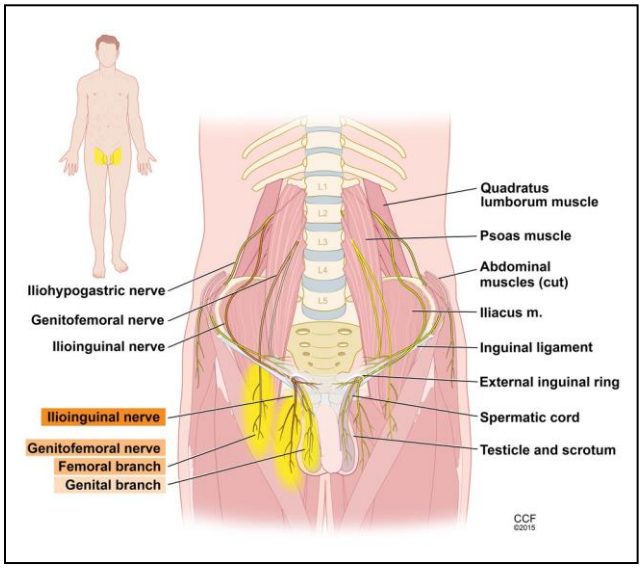


FIG-08.LAPROSCOPIC ANATOMY OF INGUINAL REGION

The pre peritoneal anatomy seen in laparoscopic hernia repair led to characterization of important anatomic areas of interest , known as the *triangle of doom*, the *triangle of pain*, and the *circle of death.*

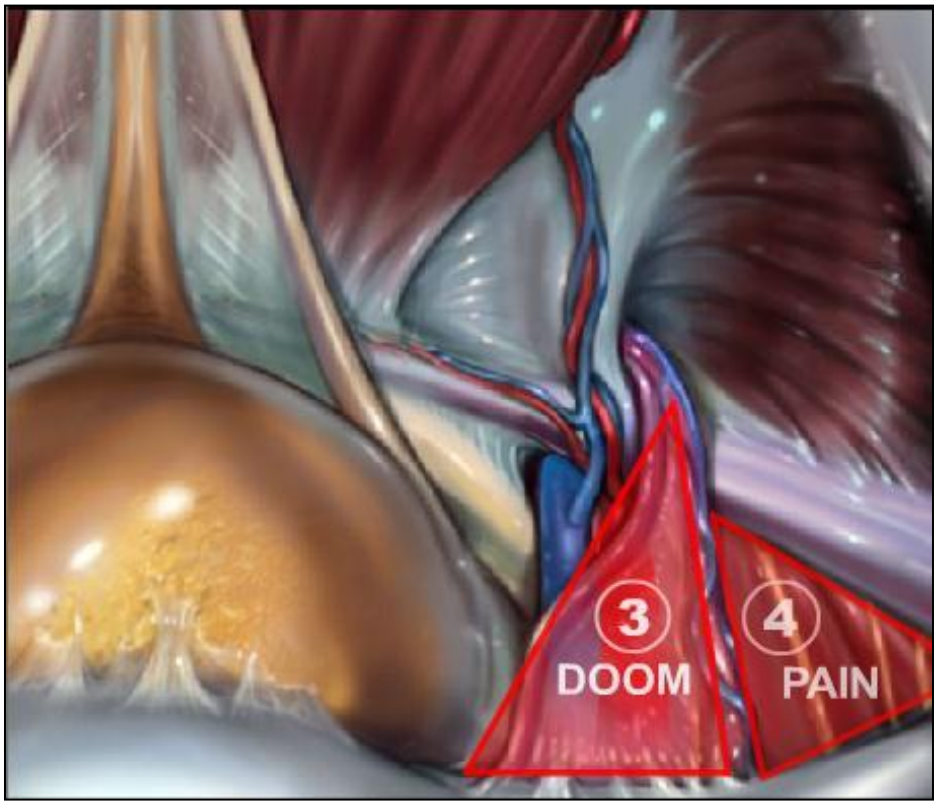


FIG-09.TRIANGLES IN LAPROSCOPIC REPAIR

The **triangle of doom** is bordered medially by the vas deferens and laterally by the vessels of the spermatic cord. The contents of the space include the external iliac vessels, deep circumflex iliac vein, femoral nerve, and genital branch of the genitofemoral nerve. The **triangle of pain** is a region bordered by the iliopubic tract and gonadal vessels, and it encompasses the lateral femoral cutaneous,

femoral branch of the genitofemoral, and femoral nerves. The **circle of death** is a vascular continuation formed by the common iliac, internal iliac, obturator, inferior epigastric, and external iliac vessels.

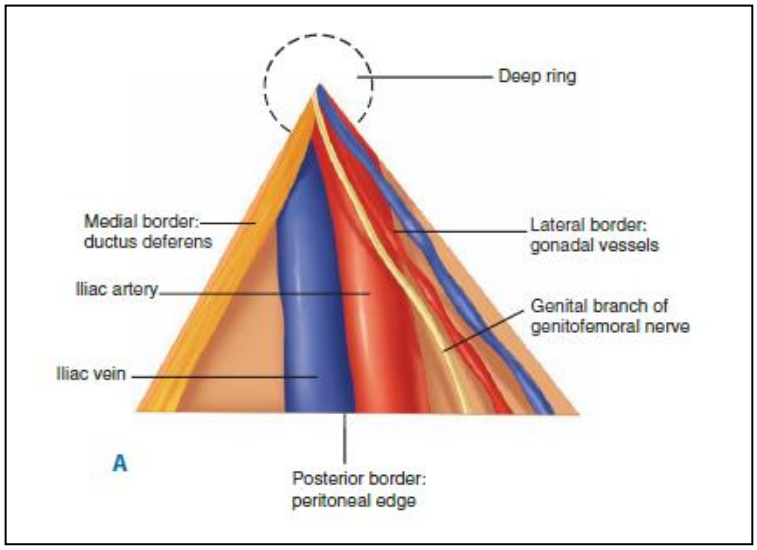


FIG-10.TRIANGLE OF DOOM

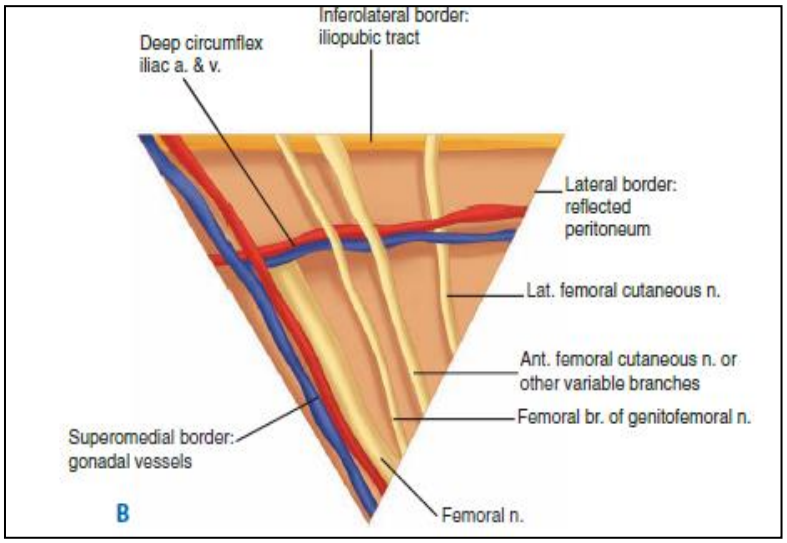


FIG-11.TRIANGLE OF PAIN

TERMINOLOGY

In referring to inguinal hernias, a major defining point is location of the defect direct versus indirect. This distinction is strictly anatomic because the operative repair is the same for both types. Approximately two thirds of inguinal hernias are indirect. Men are 25 times more likely to have an inguinal hernia than women, and indirect hernias are more common regardless of gender. A ***direct inguinal hernia*** is defined as a weakness in the transversalis fascia within the area bordered by the inguinal ligament inferiorly, the lateral border of the rectus sheath medially, and the inferior epigastric vessels laterally. This area is referred to as ***Hesselbach's triangle***.

Located lateral to the inferior epigastric vessels, an ***indirect inguinal hernia*** is characterized by the protrusion of the hernia sac through the internal inguinal ring toward the external inguinal ring and, at times, into the scrotum. Indirect inguinal hernias result from a failure of the processus vaginalis to close completely. An inguinal hernia that has direct and indirect components is referred to as a ***pantaloon hernia***.

A hernia is defined as ***reducible*** if its contents can be placed back into the peritoneal cavity, alleviating their displacement through the musculature. In contrast, a hernia with contents that cannot be reduced is termed ***incarcerated***. If

the blood supply to the contents of the hernia is compromised, the hernia is defined as ***strangulated***. Strangulation is a potentially fatal complication of a hernia and should always be considered a surgical emergency. Less common inguinal hernias include ***Amyand's hernia,*** with the appendix (normal or acutely inflammed) contained in the hernia sac, and ***Littre's hernia,*** which contains a Meckel's diverticulum.

SPECIAL PROBLEMS

SLIDING HERNIA

A sliding hernia occurs when an internal organ comprises a portion of the wall of the hernia sac. The most common viscous involved is the colon or urinary bladder. Most sliding hernias are a variant of indirect inguinal hernias, although femoral and direct sliding hernias can occur. The primary danger associated with a sliding hernia is the failure to recognize the visceral component of the hernia sac before injury to the bowel or bladder. The sliding hernia contents are reduced into the peritoneal cavity, and any excess hernia sac is ligated and divided.

PATHOPHYSIOLOGY

Inguinal hernias may be **congenital or acquired**. Most adult inguinal hernias are considered **acquired** defects in the abdominal wall although collagen studies have demonstrated a heritable predisposition. A number of studies have attempted to delineate the precise causes of inguinal hernia formation; however, the best-characterized risk factor is weakness in the abdominal wall musculature. **Congenital** hernias, which make up the majority of paediatric hernias, can be considered an impedance of normal development, rather than an acquired weakness. During the normal course of development, the testes descend from the intra abdominal space into the scrotum in the third trimester. Their descent is preceded by the gubernaculum and a diverticulum of peritoneum, which protrudes through the inguinal canal and becomes the processus vaginalis. Between 36 and 40 weeks of gestation, the processus vaginalis closes and eliminates the peritoneal opening at the internal inguinal ring. Failure of the peritoneum to close results in a patent processus vaginalis (PPV), hence the high incidence of indirect inguinal hernias in preterm babies. Children with congenital indirect inguinal hernias will present with a PPV; however, a patent processus does not necessarily indicate an inguinal hernia. In a study of nearly 600 adults undergoing general laparoscopy, bilateral inspection revealed that 12% had PPV. None of these patients had clinically significant symptoms of a groin hernia. In a group of 300 patients

undergoing unilateral laparoscopic inguinal hernia repair, 12% were found to have a contralateral PPV, which was associated with a fourfold 5-year incidence of inguinal hernia.

The presence of a PPV likely predisposes a patient to the development of an inguinal hernia. This likelihood depends on the presence of other risk factors such as inherent tissue weakness, family history, and strenuous activity. Overall, there are limited data regarding the etiology of inguinal hernia development.

-Several studies have documented strenuous physical activity as a risk factor for acquired inguinal hernia. Repeated physical exertion may increase intra-abdominal pressure; however, whether this process occurs in combination with a PPV or through age-related weakness of abdominal wall musculature is unknown. A case controlled study of over 1400 male patients with inguinal hernia revealed that a positive family history was associated with an eightfold lifetime incidence of inguinal hernia.

-Chronic obstructive pulmonary disease also significantly increases the risk of direct inguinal hernias, as it is accompanied by repeated episodes of high intra abdominal pressure.

-Several studies have suggested a protective effect of obesity. In a large, population-based prospective study of American individuals (First National Health

and Nutrition Examination Survey), the risk of inguinal hernia development in obese men was only 50% that of normal weight males, whereas the risk in overweight males was 80% that of nonobese men. A possible explanation is the increased difficulty in detecting inguinal hernias in obese individuals.

-Epidemiologic studies have identified risk factors that may predispose to a hernia. Microscopic examination of skin of inguinal hernia patients demonstrated significantly decreased ratios of type I to type III collagen. Type III collagen does not contribute to wound tensile strength as significantly as type I collagen. Additional analyses revealed disaggregated collagen tracts with decreased collagen fibre density in hernia patients' skin. Collagen disorders such as Ehlers-Danlos syndrome are also associated with an increased incidence of hernia formation. Recent studies have found an association between concentrations of extracellular matrix elements and hernia formation. Although a significant amount of work remains to elucidate the biologic nature of hernias, current evidence suggests they have a multifactorial etiology with both environmental and hereditary influences.

OTHER HERNIA TYPES

UMBILICAL HERNIA

The umbilicus is formed by the umbilical ring of the linea alba. Intra abdominally, the round ligament (ligamentum teres) and paraumbilical veins join into the umbilicus superiorly and the median umbilical ligament (obliterated urachus) enters inferiorly. Umbilical hernias in infants are congenital and are common. They close spontaneously in most cases by the age of 2 years. Those that persist after the age of 5 years are frequently repaired surgically, although complications related to these hernias in children are unusual.

Umbilical hernias in adults are largely acquired. These hernias are more common in women and in patients with conditions that result in increased intra-abdominal pressure, such as pregnancy, obesity, ascites, or chronic abdominal distension. Umbilical hernia is more common in those who have only a single midline aponeurotic decussation compared with the normal decussation of fibres from all three lateral abdominal muscles. Strangulation is unusual in most patients; however, strangulation or rupture can occur in chronic ascitic conditions. Small asymptomatic umbilical hernias barely detectable on examination need not be repaired. Adults who have symptoms, a large hernia, incarceration, thinning of the overlying skin, or uncontrollable ascites should have hernia repair. Spontaneous

rupture of umbilical hernias in patients with ascites can result in peritonitis and death.

Classically, repair was done using the vest over pants repair proposed by Mayo, which uses imbrication of the superior and inferior fascial edges. Because of increased tension on the repair and recurrence rates of almost 30% with long-term follow-up, however, the Mayo repair is rarely performed today. Instead, small defects are closed primarily after separation of the sac from the overlying umbilicus and surrounding fascia. Defects larger than 3 cm are closed using prosthetic mesh. There are a number of techniques to place this mesh and no prospective data have conclusively found clear advantages of one technique over another. Options for mesh implantation include bridging the defect, placing a preperitoneal underlay of mesh reinforced with suture repair, and placing it laparoscopically. The laparoscopic technique requires general anesthesia and is reserved for large defects or recurrent umbilical hernias. There is no universal consensus on the most appropriate method of umbilical hernia repair.

EPIGASTRIC HERNIA

Approximately 3% to 5% of the population has epigastric hernias. Epigastric hernias are two to three times more common in men. These hernias are located between the xiphoid process and umbilicus and are usually within 5 to 6 cm of the

umbilicus. Like umbilical hernias, epigastric hernias are more common in individuals with a single aponeurotic decussation. The defects are small and often produce pain out of proportion to their size because of incarceration of pre peritoneal fat. They are multiple in up to 20% of patients and approximately 80% are in the midline. Repair usually consists of excision of the incarcerated pre peritoneal tissue and simple closure of the fascial defect, similar to that for umbilical hernias. Small defects can be repaired under local anaesthesia. Uncommonly, these defects can be sizable, can contain omentum or other intra-abdominal viscera, and may require mesh repairs. Epigastric hernias are better repaired anteriorly because the defect is small and fat that has herniated from within the peritoneal cavity is difficult to reduce.

INCISIONAL HERNIA

Of all hernias encountered, incisional hernias can be the most frustrating and difficult to treat. Incisional hernias occur as a result of excessive tension and inadequate healing of a previous incision, which may be associated with surgical site infection. These hernias enlarge over time, leading to pain, bowel obstruction, incarceration, and strangulation. Obesity, advanced age, malnutrition, ascites, pregnancy, and conditions that increase intra-abdominal pressure are factors that predispose to the development of an incisional hernia. Obesity can cause an

incisional hernia to occur because of increased tension on the abdominal wall from the excessive bulk of a thick pannus and large omental mass. Chronic pulmonary disease and diabetes mellitus have also been recognized as risk factors for the development of incisional hernia. Medications such as corticosteroids and chemotherapeutic agents and surgical site infection can contribute to poor wound healing and increase the risk for developing an incisional hernia.

Large hernias can result in loss of abdominal domain, which occurs when the abdominal contents no longer reside in the abdominal cavity. These large abdominal wall defects also can result from the inability to close the abdomen primarily because of bowel edema, abdominal packing, peritonitis, and repeat laparotomy. With loss of domain, the natural rigidity of the abdominal wall becomes compromised and the abdominal musculature is often retracted. Respiratory dysfunction can occur because these large ventral defects cause paradoxical respiratory abdominal motion. Loss of abdominal domain can also result in bowel edema, stasis of the splanchnic venous system, urinary retention, and constipation. Return of displaced viscera to the abdominal cavity during repair may lead to increased abdominal pressure, abdominal compartment syndrome, and acute respiratory failure.

UNUSUAL HERNIAS

There are a number of hernias that occur infrequently, of various types.

TYPES

SPIGELIAN HERNIA

A spigelian hernia occurs through the spigelian fascia, which is composed of the aponeurotic layer between the rectus muscle medially and semilunar line laterally. Almost all spigelian hernias occur at or below the arcuate line. The absence of posterior rectus fascia may contribute to an inherent weakness in this area. These hernias are often interparietal, with the hernia sac dissecting posterior to the external oblique aponeurosis. Most spigelian hernias are small (1 to 2 cm in diameter) and develop during the fourth to seventh decades of life. Patients often present with localized pain in the area without a bulge because the hernia lies beneath the intact external oblique aponeurosis. Ultrasound or CT of the abdomen can be useful to establish the diagnosis.

A spigelian hernia is repaired because of the risk for incarceration associated with its relatively narrow neck. The hernia site is marked before operation. A transverse incision is made over the defect and carried through the external oblique aponeurosis. The hernia sac is opened, dissected free of the neck of the hernia, and

excised or inverted. The defect is closed transversely by simple suture repair of the transversus abdominis and internal oblique muscles, followed by closure of the external oblique aponeurosis. Larger defects are repaired using a mesh prosthesis. Recurrence is uncommon.

OBTURATOR HERNIA

The obturator canal is formed by the union of the pubic bone and ischium. The canal is covered by a membrane pierced at the medial and superior border by the obturator nerve and vessels. Weakening of the obturator membrane may result in enlargement of the canal and formation of a hernia sac, which can lead to intestinal incarceration and strangulation. The patient can present with evidence of compression of the obturator nerve, which causes pain in the anteromedial aspect of the thigh (Howship-Romberg sign) that is relieved by thigh extension. Almost 50% of patients with obturator hernia present with complete or partial bowel obstruction. An abdominal CT scan can establish the diagnosis, if necessary.

A posterior approach, open or laparoscopic, is preferred. is approach provides direct access to the hernia. After reduction of the hernia sac and contents, any preperitoneal fat within the obturator canal is reduced. If necessary, the obturator foramen is opened posterior to the nerve and vessels. The obturator nerve can be manipulated gently with a blunt nerve hook to facilitate reduction of the fat

pad. The obturator foramen is repaired with prosthetic mesh, taking care to avoid injury to the obturator nerve and vessels. Patients with compromised bowel usually require laparotomy.

LUMBAR HERNIA

Lumbar hernias can be congenital or acquired after an operation on the renalangle and occur in the lumbar region of the posterior abdominal wall. Hernias through the superior lumbar triangle (Grynfeltt's triangle) are more common. The superior lumbar triangle is bounded by the 12th rib, paraspinal muscles, and internal oblique muscle. Less common are hernias through the inferior lumbar triangle (Petit's triangle), which is bounded by the iliac crest, latissimus dorsi muscle, and external oblique muscle. Weakness of the lumbodorsal fascia through either of these areas results in progressive protrusion of extraperitoneal fat and a hernia sac. Lumbar hernias are not prone to incarceration. Small lumbar hernias are frequently asymptomatic. Larger hernias may be associated with back pain. CT is useful for diagnosis.

Both open and laparoscopic repairs are useful. Satisfactory suture repair is difficult because of the immobile bony margins of these defects. Repair is best done by placement of prosthetic mesh, which is sutured beyond the margins of the hernia. There is usually sufficient fascia over the bone to anchor the mesh.

INTERPARIETAL HERNIA

Interparietal hernias are rare and occur when the hernia sac lies between layers of the abdominal wall. These hernias most frequently occur in previous incisions. Spigelian hernias are almost always interparietal.

The correct preoperative diagnosis of interparietal hernia can be difficult. Many patients with complicated interparietal hernias present with intestinal obstruction. Abdominal CT can assist in the diagnosis. Large interparietal hernias usually require placement of prosthetic mesh for closure. When this cannot be done, the component separation technique may be useful to provide natural tissues to obliterate the defect.

SCIATIC HERNIA

The greater sciatic foramen can be a site of hernia formation. These hernias are extremely unusual and difficult to diagnose and frequently are asymptomatic until intestinal obstruction occurs. In the absence of intestinal obstruction, the most common symptom is the presence of an uncomfortable or slowly enlarging mass in the gluteal or intragluteal area. Sciatic nerve pain can occur, but sciatic hernia is a rare cause of sciatic neuralgia.

A transperitoneal approach is preferred if bowel obstruction or strangulation is suspected. Hernia contents can usually be reduced with gentle traction. Prosthetic mesh repair is usually preferred. A transgluteal approach can be used if the diagnosis is certain and the hernia is reducible, but most surgeons are not familiar with this approach. With the patient prone, an incision is made from the posterior edge of the greater trochanter across the hernia mass. The gluteus maximus muscle is opened, and the sac is visualized. The muscle edges of the defect are reapproximated with interrupted sutures or the defect is obliterated with mesh.

PERINEAL HERNIA

Perineal hernias are caused by congenital or acquired defects and are quite uncommon. These hernias may also occur after abdominoperineal resection or perineal prostatectomy. The hernia sac protrudes through the pelvic diaphragm. Primary perineal hernias are rare, occur most commonly in older multiparous women, and can be quite large. Symptoms are usually related to protrusion of a mass through the defect that is worsened by sitting or standing. A bulge is frequently detected on bimanual rectal-vaginal examination.

Perineal hernias are generally repaired through a transabdominal approach or combined transabdominal and perineal approaches. After the sac contents are

reduced, small defects may be closed with nonabsorbable suture, whereas large defects are repaired with prosthetic mesh.

LOSS OF DOMAIN HERNIAS

Loss of domain implies a massive hernia in which the herniated contents have resided for so long outside the abdominal cavity that they cannot simply be replaced into the peritoneal cavity. We typically classify loss of domain hernias into patients with and without preoperative contamination. Each group is then subcategorized into two groups. Patients with a small hernia defect and a massive hernia sac (e.g., large inguinoscrotal hernias) require restoration of peritoneal cavity domain, whereas patients with a large defect and a massive hernia sac (open abdomen with skin graft) require restoration of peritoneal domain and reconstruction of the abdominal wall.

Prior to repair of these complex defects, the patient must undergo careful preoperative evaluation. A clear understanding of the morbidity and mortality associated with these reconstructive procedures is critical. Weight reduction, smoking cessation, optimization of nutrition, and glucose control are all important aspects of complex abdominal wall reconstruction. Previously, methods to stretch the abdominal wall gradually were used to allow for the restoration of abdominal domain and closure. This was accomplished by :

- insufflation of air into the abdominal cavity to create a progressive pneumoperitoneum. Repeated administrations of increasing volumes of air over 1 to 3 weeks allowed the muscles of the abdominal wall to become lax enough for primary closure of the defect. This technique is particularly suited for small defects and massive hernia sacs.

–For large defects, we prefer a staged approach using expanded PTFE (ePTFE) dual mesh for patients with loss of abdominal domain and lateral retraction of the abdominal wall musculature. The initial stage involves reduction of the hernia and placement of a large sheet of ePTFE dual mesh secured to the fascial edges with a running suture. Subsequent stages involve serial elliptical excision of the mesh until the fascia can be approximated in the midline without tension. Finally, the mesh is completely excised and the fascia is reapproximated with component separation and a biologic underlay patch, if necessary.

PARASTOMAL HERNIA

Parastomal hernia is a common complication of stoma creation. In fact, the creation of a stoma by strict definition is an abdominal wall hernia. The incidence of parastomal hernias is highest for colostomies and occurs in up to 50% of stomas. Fortunately, most patients remain asymptomatic and life-threatening complications, such as bowel obstruction and strangulation, are rare. Unlike

midline incisional hernia repair, routine repair of parastomal hernias is not recommended. Surgical repair should be reserved for patients experiencing symptoms of bowel obstruction, problems with pouch , or cosmetic issues.

Three general approaches are available for parastomal hernia repair. These techniques include :

- primary fascial repair,

-stoma relocation, and

-prosthetic repair.

Primary fascial repair involves hernia reduction and primary fascial reapproximation through a peristomal incision. This technique carries a predictably high recurrence rate. The advantage of this approach is that the abdomen often is not entered, making the operation less complex. Because of the high recurrence rate with this technique, it should be reserved for patients who will not tolerate a laparotomy. Stoma relocation improves results; however, it requires a laparotomy and predisposes to another parastomal hernia in the future. To reduce the rate of recurrent herniation, some surgeons reinforce the repair with biologic mesh in a keyhole fashion around the new stoma site. Early results are promising but longterm outcomes have not yet been reported. Prosthetic repairs of parastomal

hernias can provide excellent longterm results with a lower rate of hernia recurrence, but a higher rate of prosthetic complications must be accepted.

Regardless of the technique, a permanent foreign body placed in apposition to the bowel can result in erosion, obstruction, and disastrous complications. Several approaches to prosthetic mesh placement have been described. The mesh can be placed as an onlay patch, intra-abdominally, or in the retrorectus position. When placing the mesh intraperitoneally, a keyhole is fashioned around the stoma site or placed as a at sheet, lateralizing the stoma as it exits the abdomen.

TESTING INGUINAL HERNIA IN CHILDREN

Fullness is seen over the groin when compared to opposite side is seen. In difficult small hernia, child is made to cry or jolt or jump, later superficial ring is palpated to feel the cord which will be thicker than opposite side. Rolling the contents of the inguinal canal by finger will give the sensation of finger of a rubber glove which is wet inside.

GORNALL'S TEST

Child is held from back to place both hands in front over the abdomen which is pressed with fingers and child is lifted up. This raises the intra- abdominal pressure to make hernia more prominent.

TREATMENT

Surgical repair is the definitive treatment of inguinal hernias; however, operation is not necessary in a subset of patients. When the patient's medical condition confers an unacceptable level of operative risk, elective surgery should be deferred until the condition resolves, and operations reserved for life threatening emergencies. Although the natural history of untreated inguinal hernias is poorly defined, the rates of incarceration and strangulation are low in the asymptomatic population. As a result, nonoperative management is an appropriate consideration in minimally symptomatic patients. A nonoperative strategy is safe for minimally symptomatic inguinal hernia patients, and it does not increase the risk of developing hernia complications.

Nonoperative inguinal hernia treatment targets pain, pressure, and protrusion of abdominal contents in the symptomatic patient population. The recumbent position aids in hernia reduction via the effects of gravity and a relaxed abdominal wall. **Trusses** externally confine hernias to a reduced state and intermittently relieve symptoms in up to 65% of patients; however, they do not prevent complications, and they may be associated with an increased rate of incarceration. The risks of incarceration and strangulation appear to decrease over the first year, likely because gradual enlargement of the abdominal wall defect facilitates

spontaneous reduction of hernia contents. The sheer volume of protruding tissue in an inguinal hernia does not necessarily signify severe morbidity. Femoral and symptomatic inguinal hernias carry higher complication risks, and so surgical repair is performed earlier for these patients.

The administration of preoperative prophylactic antibiotics in elective inguinal hernia repair remains controversial. Overall wound infection rates are higher than those expected for clean operations, and there was a significant reduction in the rate of wound infection among patients undergoing repair with a prosthetic mesh. Although there is no universal guideline regarding the administration of prophylactic antibiotics for open elective hernia repair, it is our experience that meticulous perioperative protocol and surgical technique are more reliable countermeasures to prevent wound infection than antibiotics.

Incarceration occurs when hernia contents fail to reduce; however, a minimally symptomatic, chronically incarcerated hernia may also be treated nonoperatively. **Taxis** should be attempted for incarcerated hernias without sequelae of strangulation, and the option of surgical repair should be discussed prior to the maneuver. To perform taxis, analgesics and light sedatives are administered, and the patient is placed in the Trendelenburg position. The hernia sac is elongated with both hands, and the contents are compressed in a milking fashion to ease their

reduction into the abdomen.

The indication for emergency inguinal hernia repair is impending compromise of intestinal contents. As such, strangulation of hernia contents is a surgical emergency. Clinical signs that indicate strangulation include fever, leukocytosis, and hemodynamic instability. The hernia bulge is usually warm and tender, and the overlying skin may be erythematous or discolored. Symptoms of bowel obstruction in patients with sliding or incarcerated inguinal hernias may also indicate strangulation. Taxis should not be performed when strangulation is suspected, as reduction of potentially gangrenous tissue into the abdomen may result in an intra-abdominal catastrophe. Preoperatively, the patient should receive fluid resuscitation, nasogastric decompression, and prophylactic intravenous antibiotics.

SURGICAL APPROACH:-

Presently, the repairs can be classified into three groups:

-**Open sutured repair**: a reconstruction of the inguinal canal with tissue repair only.

-**Open mesh repair**: a piece of mesh or mesh plug covering or obliterating the hernia defect, either on the anterior or posterior aspect of the abdominal wall.

-**laparoscopic repair** : laparoscopic placement of a mesh covering the myopectineal orifice on the posterior aspect of the abdominal wall.

Among currently used **open sutured repairs** are the following:

1.**Bassini's repair** : first described by Bassini in 1887, implying an anatomical repair of the posterior wall of the inguinal canal with interrupted non-absorbable sutures.

2.**Shouldice's repair:** based on the Bassini repair but carried out in several layers with a running suture. This method was used as the gold standard for inguinal hernia repair in Sweden during the first part of the 1990s.

3.**Marcy's :** introduced in 1871, implying a tightening of the hernia orifice with a few sutures; mainly used for small lateral hernias without weakening of the posterior wall

Among the currently used **open mesh repairs** are the following:

1.**Nyhus buttress** –based on an older, open, sutured, retromuscular, preperitoneal technique, described by Nyhus in 1959. In the late 1970s this technique was modified by the addition of a preperitoneally placed mesh

2.**Stoppa's repair** – another open, retromuscular, preperitoneal technique used since the 1960s. A Mersilene or Dacron mesh is placed preperitoneally through a lower midline incision covering the myopectineal orifices bilaterally

3.**Lichtenstein's repair**– introduced by I. Lichtenstein in 1970and used as the gold standard for hernia repair in Sweden for the last 15 years. A polypropylene mesh is positioned on the transverse and internal oblique muscle to reinforce the posterior wall of the inguinal canal.

4.**Plug and patch**– or the Rutkow-Robbins repair : described in 1993. The hernia orifice is obliterated with a cone-shaped polypropylene mesh combined with a flat polypropylene mesh. Among the laparoscopic repairs are the following:

IPOM

– IntraPeritoneal Onlay Mesh, described by Filipi in 1992.The mesh is placed intraperitoneally covering the hernial orifice with a minimum of dissection.

Following are the laparoscopic techniques used:

1.TAPP :

-TransAbdominal PrePeritoneal repair, first described by Arregui in 1991. A mesh is placed preperitoneally, covering the inguinal and femoral hernia orifices via a transabdominal approach.

2.TEP :

–Totally ExtraPeritoneal repair, described independently in 1993 by two surgeons, McKernan and Phillips. The mesh is placed preperitoneally as in TAPP, but without entering the abdominal cavity.

LICHENSTEIN'S TENSION FREE MESH REPAIR:

Open inguinal hernia repair has evolved from primary tissue repairs (tension repairs) to tension-free repair with mesh placement. However, an understanding of tissue-based repairs remains important, particularly for surgeons repairing inguinal hernias in the setting of contamination. *Tension-free repair* with mesh can be performed with many different techniques. Several unique mesh modifications enable the surgeon to patch the defect through an anterior approach (Lichtenstein), use a prosthetic plug (plug and patch), or place a bilayered mesh for anterior and posterior repair. Each of these approaches has unique advantages and disadvantages.

To understand the anterior approach, the surgeon must appreciate the layers of the abdominal wall and their relation to the inguinal canal. The layers and the location of their neurovascular structures include skin, subcutaneous fat (Camper's and Scarpa's fasciae), muscles (external and internal oblique, transversus abdominis), transversalis fascia, preperitoneal fat, and peritoneum. The inguinal canal is approximately 4 cm in length and extends from the internal inguinal ring to the external inguinal ring. Within the inguinal canal lies the spermatic cord, which consists of the testicular artery, pampiniform venous plexus, the genital branch of the genito femoral nerve, the vas deferens, cremasteric muscle fibers, cremasteric vessels, and the lymphatics. The superficial border of the inguinal canal is the external oblique aponeurosis. As the external oblique aponeurosis forms the inguinal (Poupart's) ligament, it rolls posteriorly, forming a "shelving edge," and defines the inferior border of the inguinal canal with the lacunar ligament. Posteriorly, the inguinal canal is bound by the transversalis fascia, often referred to as the "floor" of the inguinal canal. The inguinal canal is bound superiorly by the internal oblique and transversus abdominis musculoaponeurosis

Before making an incision, it is essential for the surgeon to identify the landmarks defining the inguinal ligament. The anterior superior iliac spine (ASIS) and pubic tubercle are the insertion points for the inguinal ligament. One of the challenging aspects of open inguinal hernia repair is securing the mesh to medial

components.

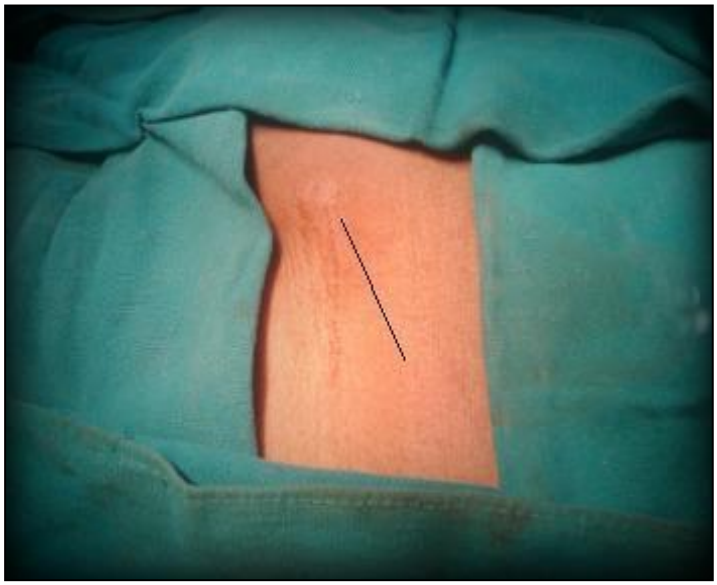


FIG 12.a.INCISION IN INGUINAL HERNIA

To help expose this area, the incision should begin over the pubis and extend 1 to 2 cm cephalad to the inguinal ligament, from the external ring to the internal ring.

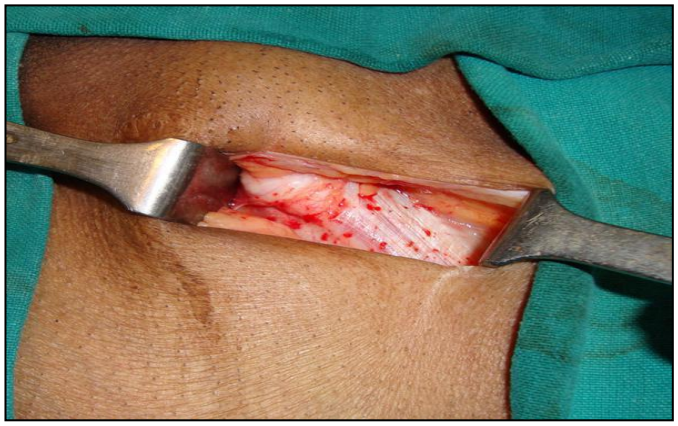


Fig-12.b. INCISION EXPOSING EXTERNAL OBLIQUE APONEUROSIS

Dissection through the subcutaneous fat and Scarpa's fascia leads to the external oblique aponeurosis. Once encountered, the external oblique aponeurosis is completely exposed and the external inguinal ring is identified. The external oblique aponeurosis is incised sharply. The incision is extended along the fibers of the external oblique aponeurosis to the external inguinal ring, to expose the inguinal canal. At this time it is important to identify and isolate the iliohypogastric and ilioinguinal nerves to avoid injury.

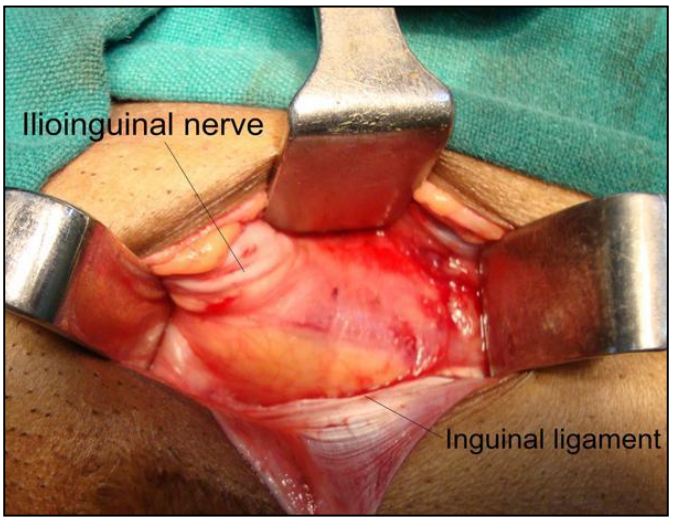


FIG12.c . INCISION EXPOSING NERVES

Failure to identify these nerves puts patients at greater risk of developing chronic pain through entrapment or transection. The iliohypogastric nerve is typically found lying on the internal oblique abdominal muscle after the edges of the external oblique aponeurosis are elevated. The ilioinguinal nerve runs along the

spermatic cord through the internal inguinal ring and terminates at the skin of the upper and medial parts of the thigh. Regardless of approach, identification of the nerves is critical to prevent inadvertent entrapment.

Through a combination of sharp and blunt dissection, the spermatic cord is mobilized at the pubic tubercle. Staying close to the pubic tubercle avoids confusion of the tissue planes and disruption of the floor of the inguinal canal. Once mobilized, the spermatic cord is encircled with a Penrose drain to allow for easy retraction. Avoiding excessive traction is important to reduce testicular engorgement and early postoperative discomfort.

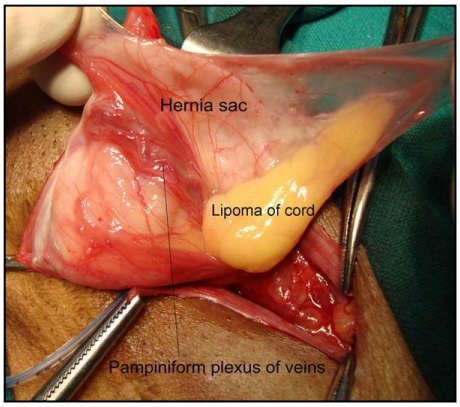


Fig-12.d HERNIAL SAC EXPOSED

To facilitate identifica tion of the hernia sac, the cremaster muscle is separated from the spermatic cord through blunt dissection. The hernia sac is usually found anterior and superior to the spermatic cord in an indirect hernia,

whereas the sac protrudes directly through the floor of the inguinal canal in a direct hernia. During repair of an indirect hernia, the sac is cautiously separated from the spermatic cord down to the level of the internal inguinal ring.

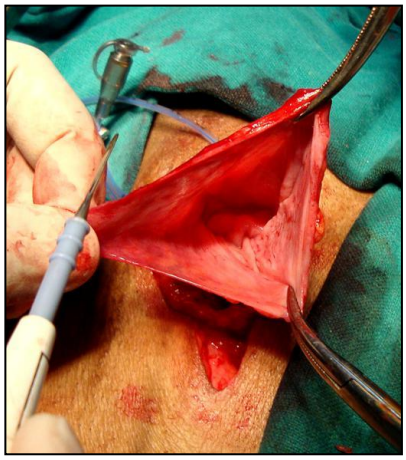


FIG 12.e. SAC EXAMINATION

The hernia sac is examined for visceral contents. With a large hernia, the sac may be opened to ensure there are no contents before ligation and reduction. The hernia sac can be reduced into the preperitoneal space, or the neck of the sac is ligated at the internal inguinal ring and excess sac excised. If present, a lipoma of the cord, with retroperitoneal fat herniating through the internal inguinal ring, should be ligated and excised before the surgeon begins repair of the inguinal canal.

Guided by the principle that tension increases recurrence in hernia repair, placement of synthetic mesh to reinforce the floor of the inguinal canal and recreate the internal inguinal ring has become the primary method of anterior inguinal hernia repair. Using a nonabsorbable synthetic mesh, a slit is cut in the distal lateral edge to accommodate the spermatic cord. The mesh is first secured to the pubic tubercle with a nonabsorbable mono lament running suture.

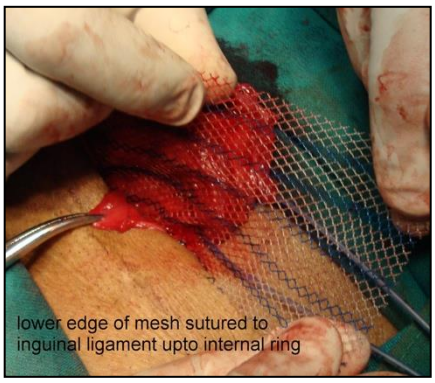


FIG 12.f. MESH FIXATION TO INGUINAL LIGAMENT

Three or four interrupted sutures are placed along the conjoined tendon or transversus abdominis muscle to the internal inguinal ring. Inferolaterally, the suture is run along the shelving edge of the inguinal ligament to a point lateral to the internal inguinal ring. The tails of the mesh are sutured together, creating a new internal inguinal ring through which the spermatic cord structures and ilioinguinal nerve are placed.

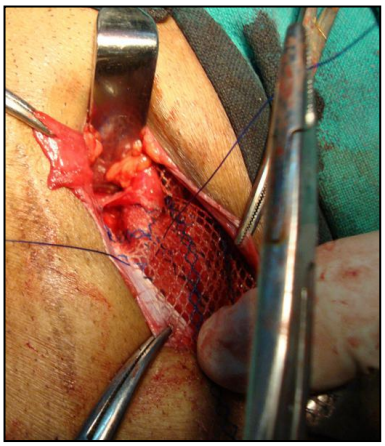


FIG 12.g. MESH FIXATION

It is of critical importance when fixing the mesh in place at the inguinal ligament to respect the femoral vessels, which run directly below the inguinal ligament in the femoral sheath.

FIG 12.h SKIN CLOSURE

After the mesh is secured, the external oblique aponeurosis is reapproximated with braided absorbable suture from lateral to medial. During closure of the external oblique aponeurosis, the external inguinal ring is recreated. Scarpa's fascia is reapproximated, and a continuous subcuticular stitch/interrupted matress is used for skin closure.

LAPAROSCOPIC APPROACHES :

The two most common laparoscopic hernia repair approaches are the transabdominal preperitoneal (TAPP) and the totally extraperitoneal (TEP). In the TAPP technique the abdominal cavity is entered and a transverse incision is made in the peritoneum, starting at the medial umbilical ligament and continuing out laterally just short of the anterior superior iliac spine (ASIS). The peritoneum is peeled down from the transversalis fascia to expose the entire myo pectineal orifice and create a "pocket." Mesh is then placed into this pocket in the preperitoneal position and secured with tacks and/or glue. The peritoneum is then reclosed with suture or tacks, thus excluding the mesh from the intraabdominal contents to prevent bowel adhesions and minimize the risk of intestines being "trapped" in the preperitoneal space.

The TEP approach differs by avoiding entry into the abdominal cavity. Instead, balloon dissection creates a pocket for the mesh between the rectus abdominis muscle and the transversalis fascia.

No significant difference has been found between TAPP and TEP with regard to length of surgery, return to normal activity, or rate of recurrence. Some studies suggest a higher incidence of port site hernias and visceral injuries with TAPP, whereas more conversions may occur with TEP. Ultimately, surgeons

should choose the technique they are most comfortable with to obtain the best outcomes.

Regardless of the approach taken, the goal of laparoscopic herniorrhaphy remains a durable repair. In contrast to the open repair, the failures of the laparoscopic repair occur at the inferior border as the viscera "sneaks in" underneath the inferior edge of the mesh. As a result, sufficient dissection of the pocket along the inferior border is paramount to reduce recurrence. In addition, the authors often use bring glue to fixate the inferior edge of the mesh.

KEY ANATOMIC CONCEPTS FOR LAPAROSCOPIC REPAIR

Myopectineal Orifice

The myopectineal orifice is one of the most important anatomic features of the groin anatomy. All hernias of the groin originate from this single zone of weakness, which is covered only by transversalis fascia and peritoneum. Bisected by the inguinal ligament, the myopectineal orifice comprises the inguinal canal superiorly and the femoral canal inferiorly. The inferior border consists of the superior pubic ramus and the pectineal (Cooper's) ligament. Medially, the myopectineal orifice is bordered by the rectus abdominis muscle and the conjoined tendon. The conjoint tendon (fusion of internal oblique muscle and transversalis fascia) is also the superior border of the orifice. Laterally, the boundaries consist of

the iliopsoas muscle and lateral border of the femoral sheath.

Inguinal Ligament versus Ileopubic Tract

Although a key anatomic landmark for open (anterior) inguinal hernia repair, the inguinal ligament is not seen in the laparoscopic (posterior) repair because it is an *anterior* lamina structure. The inguinal (Poupart's) ligament is the inferior edge of the external oblique aponeurosis, extending from the ASIS to the pubic tubercle, turning posteriorly to form the "shelving edge." This shelving edge is used to secure the inferior border of the mesh in an open inguinal hernia repair. The iliopubic tract is the continuation of the transversus abdominis aponeurosis and fascia. It is located posterior to the inguinal ligament, extends from the pubic tubercle medially, and passes over the femoral vessels to insert on the ASIS laterally. This *posterior* lamina structure is an important landmark in laparoscopic inguinal hernia repair; lateral to the internal ring, no tacks should be placed below the iliopubic track because of the risk of injury to the lateral femoral cutaneous, genitofemoral, and femoral nerves.

Pectineal Ligament

The pectineal (Cooper's) ligament refers to the periosteum found along the superior ramus of the pubic bone, posterior to the iliopubic tract. The pectineal ligament is an extension of the lacunar (Gimbernat's) ligament, which connects the inguinal ligament to Cooper's ligament near their insertion site at the pubic tubercle. Cooper's ligament is frequently used for medial fixation of the mesh in a laparoscopic hernia repair.

Important anatomy in laproscopic repair

Hesselbach's triangle is formed by the lateral border of the rectus sheath, inferior epigastric vessels, and inguinal ligament . Direct hernias occur through this space, medial to the inferior epigastric arteries. Indirect hernias are found lateral to Hesselbach's triangle and the lateral umbilical ligaments, which contain the epigastric arteries.

The ***"triangle of doom"*** contains the external iliac artery and vein. It is formed medially by the vas deferens, laterally by the gonadal vessels, and inferiorly by the peritoneal edge. No tacks should be placed in this triangle to avoid injury to the iliac vessels.

The ***"triangle of pain"*** is defined by the gonadal vessels medially, iliopubic tract laterally, and peritoneal edge inferiorly. It contains the lateral femoral cutaneous nerve, femoral branch of the genitofemoral nerve, and the femoral nerve. Tacks in this area risk nerve entrapment, causing pain on the anterolateral aspect of the thigh.

The ***"circle of death,"*** also known as *corona mortis,* is a vascular ring formed by the anastomosis of an aberrant artery from the external iliac artery with the obturator artery, branching from the internal iliac artery. Tacks should be avoided here because profuse bleeding can occur if the ring is injured.

PRINCIPLES OF LAPAROSCOPIC REPAIR :

General anaesthesia is preferred in most TEP cases and is required for the TAPP approach. Patients are asked to void immediately before surgery, obviating the need for catheterization and helping prevent bladder injuries. Identification of the anatomic landmarks of Cooper's ligament medially, psoas muscle inferiorly, as well as the peritoneal sac, gonadal vessels, round ligament or vas deferens, iliac vessels, and the iliopubic tract, is key to operative safety and efficacy. Separation of the hernia sac from the cord structures before reduction of the sac helps avoid injury to the gonadal vessels and vas deferens.

Complete reduction of the hernia sac is critical to preventing recurrent hernias, as is dissection of a wide pocket for placement of the mesh and ample coverage of the direct, indirect, and femoral spaces. Minimal use of tacks, including avoidance of tacks below the iliopubic tract, is mandatory to avoid complications of chronic pain caused by nerve injury.

Importantly, a number of anatomic structures seen during the open anterior inguinal hernia approach are not visualized in the laparoscopic approach, including the inguinal and lacunar ligaments and the ilioinguinal and iliohypogastric nerves. Also, the spermatic cord, consisting of the cremasteric fibres from the internal oblique muscle, cremasteric vessels, testicular vessels, genital branch of genitofemoral nerve, vas deferens, and lymphatics, only becomes an entity within the inguinal canal, which is not seen in the laparoscopic view. The gonadal vessels, vas deferens, and genital branch of the genitofemoral nerve are seen entering the internal ring, at the entrance to the inguinal canal.

TRANSABDOMINAL PREPERITONEAL APPROACH :

The patient is positioned supine, with both arms tucked at the sides.

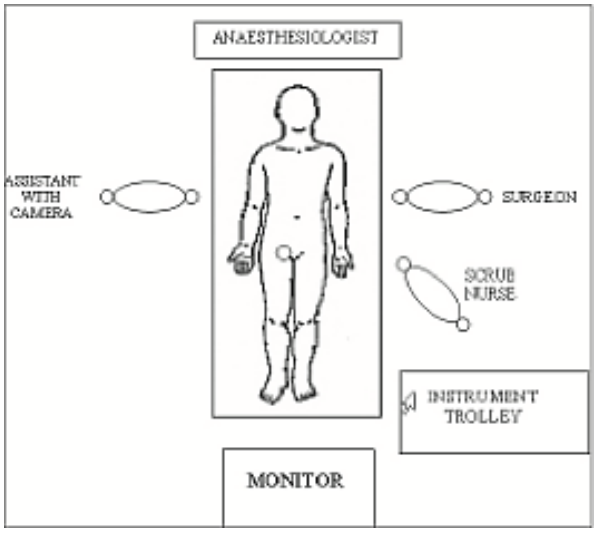


FIG 13.a. POSITION OF PATIENT FOR TAPP

Port placement for the TAPP approach typically begins by placing a 10-mm port at the umbilicus.

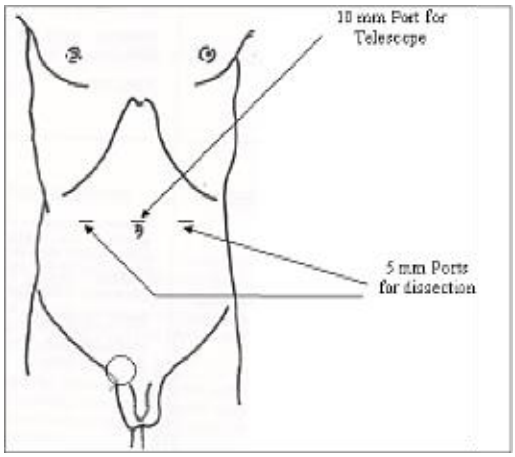


FIG 13.b. PORT PLACEMENT FOR TAPP

Once pneumoperitoneum is established to 15 mm Hg, an angled laparoscope is introduced into the abdomen.

Two additional, 5-mm ports are then placed, one at the lateral border of each rectus muscle, taking care to avoid injury to the inferior epigastric artery.

Next, both inguinal areas are inspected for hernias. Identification of the following landmarks are critical to begin dissection: medial umbilical ligament (containing obliterated umbilical artery), testicular vessels, inferior epigastric vessels (lateral umbilical ligament), and external iliac vessels.

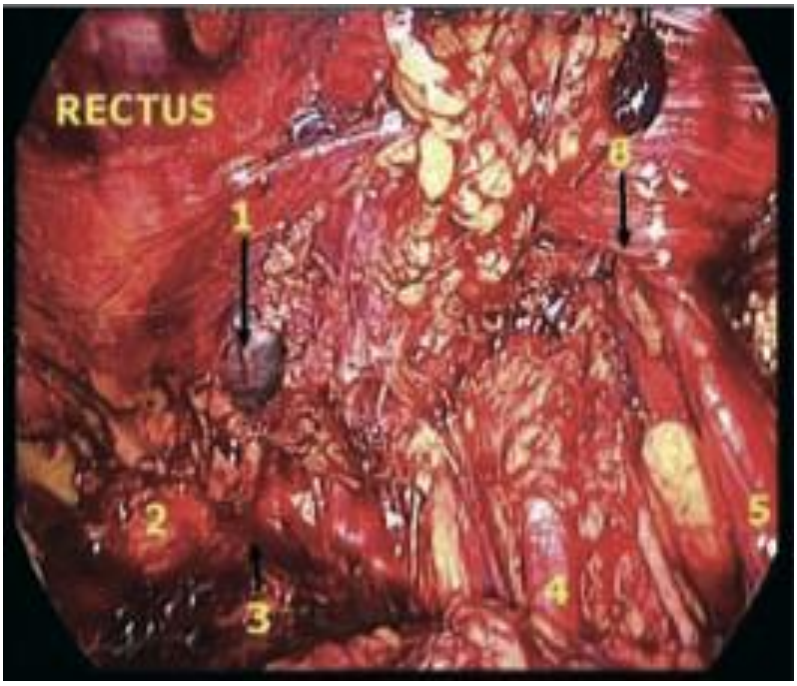


FIG 13.c. PERITONEUM REFLECTED

Right inguinal area after raising the peritoneal ap. The direct defect (1) is seen just lateral to the lateral border of the rectus muscle. The left pubic arch (2), the symphysis pubis (3) and the right pubic arch with the Cooper's ligament are seen. Laterally, the external iliac artery (4), the cord structures (5) and the arching bers of the transverses muscles (6) are exposed.

To begin the incision, the laparoscopic scissors are used to make a transverse incision in the peritoneum, starting at the medial umbilical ligament and continuing laterally along the anterior abdominal wall, ending just short of the ASIS. This incision line essentially parallels the arcuate line of Douglas. The peritoneum is then grasped along its edge and dissected away from the transversalis fascia, which remains on the anterior abdominal wall.

When creating this peritoneal gap, great care must be taken to avoid injury to the epigastric vessels and to sweep all layers toward the anterior abdominal wall, except the thin peritoneal layer. This pocket is dissected out medially to expose the pubic symphysis and Cooper's ligament, a white glistening structure along the superior pubic ramus. Lateral exposure continues 3 to 5 cm lateral to the opening of the internal inguinal ring and inferiorly until the edge of the psoas muscle is visible.

Dissection of the hernia sac, if present, is performed by placing inward traction on the peritoneum and carefully separating the sac from the cord structures. As the hernia sac is “reduced,” the spermatic cord (running posterolaterally to sac) is identified and protected. If a direct hernia is present, the sac must be separated from the transversalis fascia within Hesselbach’s triangle. It is important to separate the cord structures from the sac before reducing the sac, to avoid inadvertent injury to the vessels or vas deferens. Laterally, the gonadal vessels are also identified and dissected away from the lateral edge of the sac.

Once the peritoneal sac is completely reduced and the pocket enlarged to expose the entire myopectineal orifice, the pocket is ready for placement of the mesh. The surgeon must inspect the peritoneum for any defects made during dissection that could allow exposure of the mesh to the abdominal cavity. All defects must be repaired, or mesh with a barrier coating should be selected.

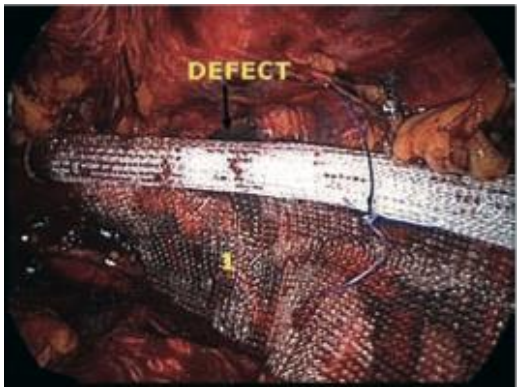


FIG 13.d. MESH FIXATION

Right direct hernia defect. The medial end of the half rolled mesh placed over the Cooper's ligament (1) going beyond the midline for a wide overlap.

The mesh is then introduced into the abdominal cavity through the umbilical port, then placed in the peritoneal pocket and unrolled to cover the entire myopectineal orifice with significant overlap. Essentially, the mesh is then positioned to cover the direct, indirect, and femoral openings. The authors typically use mesh that is 14 cm in medial-to-lateral dimension by 11 to 12 cm in craniocaudal direction.

The authors use an endoscopic tacker to fixate the mesh medially to Cooper's ligament, anteromedially to the rectus abdominis muscle, and anterolaterally to the area above the internal ring. If tacks are used lateral to the internal inguinal ring, all tacks *must* be placed above the iliopubic tract, to avoid the triangle of pain and triangle of doom. The surgeon ensures this placement by manually palpating the tip of the tacker from the outside the abdominal cavity, above the inguinal ligament. If desired, bring glue is an excellent adjunct for mesh fixation inferiorly.

The peritoneal gap is then reapproximated over the mesh with the endoscopic tacker. Great care must be taken to avoid placing tacks into the epigastric vessels. No large gaps may be left in the closure, which would expose

the mesh to the bowel and potentially allow for bowel to herniate inside the peritoneal gap. At the conclusion of the procedure, the surgeon should check to ensure both testicles are in their normal anatomic position within the scrotum.

TOTALLY EXTRAPERITONEAL APPROACH

The patient is positioned supine with both arms tucked at the sides and a single laparoscopic tower at the foot of the bed. Port placement differs from TAPP technique in that all ports for a TEP approach are placed vertically in the midline.

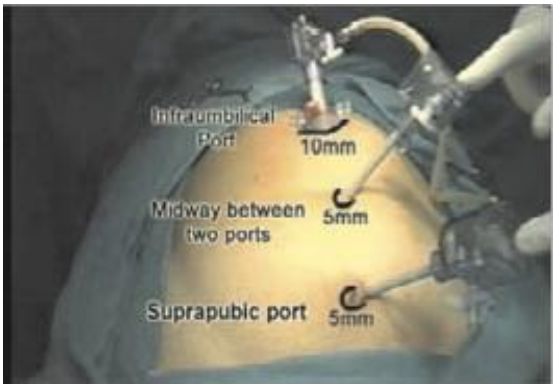


FIG.13.e.PORT PLACEMENT

To begin, a 10-mm infraumbilical incision (port) is made, and the anterior rectus sheath on the side of the hernia defect is opened longitudinally.

The rectus abdominis muscle fibers are retracted laterally to expose the posterior rectus sheath. Finger dissection is performed to free the muscle fibers from their posterior attachments, to accommodate the dissection balloon. The key

here is to avoid entering the peritoneal cavity, since the dissection plane is in the preperitoneal space.

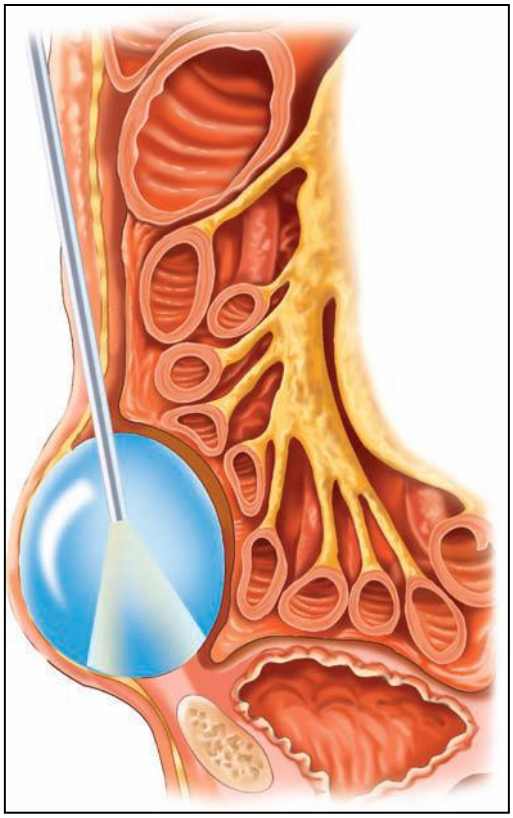


FIG.13.f. DISSECTING BALOON CATHETER

The dissecting-balloon trocar is slid into the space between the rectus muscles anteriorly and the transversalis fascia and peritoneum posteriorly until the tip reaches the pubic symphysis. Great care must be taken in this step not to injure the epigastric vessels. Insufflation is done under direct laparoscopic visualization until an adequate space is developed. The dissecting balloon is deflated and

replaced with a blunt-tipped trocar.

After placement of two additional, 5-mm ports in the lower midline, dissection is carried out similar to a TAPP repair. The landmarks of the pubic tubercle, Cooper's ligament, and inferior epigastric vessels aid in orienting the dissection. Often a direct hernia, if present, will reduce spontaneously with pneumopreperitoneum. Otherwise, clearing off the Cooper's ligament until the iliac vessels are reached, ensures exposure of the direct and femoral space.

Unlike TAPP technique, the indirect space must always be dissected out because a hernia here may not be readily apparent in a TEP approach. The peritoneum must be gently dissected from the anterior abdominal wall, from the level of the ASIS to below the iliopubic tract. If the peritoneal cavity is violated during dissection, insufflations of the abdomen may obscure the working space.

When all hernia sacs have been reduced, the mesh is ready for implantation, as in a TAPP approach.

FIG.13.g. MESH FIXATION IN TEP

The choice of whether or not to use tacks depends on surgeon preference. Most will recommend one or two tacks in Cooper's ligament if a direct hernia component is present. Once positioned, the insufflation is released as graspers hold the lower edge of the mesh in place. All trocars are removed, and the anterior rectus fascia at the 10-mm port site is closed.

PROSTHESIS CONSIDERATIONS

The success of prosthetic repairs has generated considerable debate about the desirable physical attributes of mesh and their fixation. An ideal mesh should be easy to handle, flexible, strong, immunologically inert, contraction resistant, infection resistant, and inexpensive to manufacture.

SYNTHETIC MESH MATERIAL

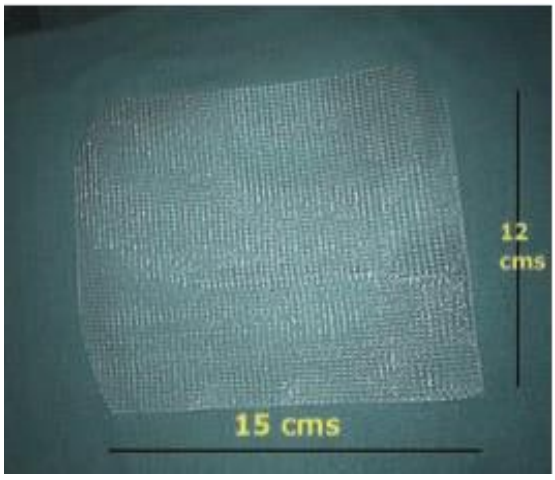


FIG.14. PROSTHETIC MATERIAL

Polypropylene and polyester are the most common synthetic prosthetic materials used in hernia repair. These materials are permanent and hydrophobic, and they promote a local inflammatory response that results in cellular infiltration and scarring with slight contraction in size. Other synthetic mesh materials are under investigation with the goals of minimizing postoperative pain and preventing infection or recurrence. In selecting mesh material, considerations include mesh absorbability, thickness, weight, porosity, and strength.

Variations in the fiber diameter and fiber count of mesh materials categorize them as heavyweight or lightweight in density. Commonly used lightweight mesh materials include β-d-glucan, titanium-coated polypropylene, and polypropylenepoliglecaprone. These materials have greater elasticity and less theoretical surface area contact with surrounding tissues than their heavyweight counterparts. Accordingly, they are hypothesized to reduce scarring and chronic pain with equivalent recurrence rates. The use of lightweight mesh in TEP and TAPP repairs is associated with fewer 3-month cumulative mesh-related complications.

A disadvantage of currently available commercial prostheses is their high cost. In settings where resources are limited, prosthetic repairs are performed using alternative materials. Polypropylene and polyethylene mosquito nets are inexpensive heavyweight mesh, and no significant difference in rates of

recurrence. When available, lightweight mesh should be considered for all prosthetic repairs to minimize postoperative chronic pain and they have similar mechanical properties to commercially available hernioplasty meshes. Furthermore, the disability-adjusted life-years (DALYs) prevented by inguinal hernia repair signify a comparable impact to that of vaccination in sub-Saharan Africa. Expensive prostheses are not necessarily needed for hernia surgery, either in resource-limited or in resource-abundant settings, and the anticipated benefits should be evaluated with consideration of increased costs.

BIOLOGIC MESH

Although indications for the use of biologic prostheses have not been absolutely defined, they are commonly reserved for contaminated cases or when domain expansion is necessary in the face of high infection risk. There are numerous biologic materials available with differing properties, but in general, they have lower tensile strength and subsequent higher rates of rupture than synthetic prostheses. They also have varying degrees of tensile strength and tissue biocompatibility between them. In ventral hernia repairs, xenograft material was associated with a lower rate of recurrence than allograft material .A review of biologic materials concluded that cross- linked graft materials are more durable and less prone to failure than non–cross-linked grafts. Nevertheless, their

diminished ability to remodel adversely affects rates of infection and incorporation. While new prosthetic materials continue to be developed, no single biologic warrants routine use. These materials will continue to evolve, and they remain an important tool for challenging cases when used judiciously.

FIXATION TECHNIQUE

Independent of prosthesis material, the method of its fixation remains disputed. Suturing, stapling, and tacking prostheses entail tissue perforation, which may cause inflammation, neurovascular injury, and chronic pain development. Conversely, improper prosthesis fixation may result in mesh migration, repair failure, meshoma pain, and hernia recurrence. Mesh may be fixed with fibrin-derived glue, and self-gripping mesh has been developed to minimize trauma to surrounding tissues and to reduce the risk for entrapment neuropathy. For hernias repaired via a strictly preperitoneal approach, prosthesis fixation may not be necessary at all.

COMPLICATIONS

As with other clean operations, the most common complications of inguinal hernia repair include bleeding, seroma, wound infection, urinary retention, ileus, and injury to adjacent structures.

Complications specific to herniorrhaphy and hernioplasty include hernia recurrence, chronic inguinal and pubic pain, and injury to the spermatic cord or testis.

SURGICAL SITE INFECTION

The risk for surgical site (wound) infection is estimated to be 1% to 2% after open inguinal hernia repair and less with laparoscopic repairs. Only a single dose of antibiotic is necessary. The placement of prosthetic mesh does not increase the risk for infection and does not a need for prophylaxis.

Superficial surgical site infections are treated by opening the incision, local wound care, and healing by secondary intention. Some mesh infections will present as a chronic draining sinus that tracks to the mesh or occur with extruded mesh. Deep surgical site infections usually involve the prosthetic mesh, which should be explanted.

The risk for infection can be decreased by using proper operative technique, preoperative antiseptic skin preparation, and appropriate hair removal. There is an increased risk for infection for patients who have had prior hernia incision infections, chronic skin infections, or infection at a distant site. These infections are treated before elective surgery.

HERNIA RECURRENCE :

When a patient develops pain, bulging, or a mass at the site of an inguinal hernia repair, clinical entities such as seroma, persistent cord lipoma, and hernia recurrence should be considered.

Common medical issues associated with recurrence include malnutrition, immunosuppression, diabetes, steroid use, and smoking. Technical causes of recurrence include improper mesh size, tissue ischemia, infection, and tension in the reconstruction. A focused physical examination should be performed. As with primary hernias, US, CT, or MRI can elucidate ambiguous physical findings. When a recurrent hernia is discovered and warrants re-operation, an approach through a virgin plane facilitates its dissection and exposure.

Pain

Pain after inguinal hernia repair is classified into acute or chronic manifestations of three mechanisms**: nociceptive (somatic), neuropathic, and visceral pain.**

Nociceptive pain is the most common of the three. Because it is usually a result of ligamentous or muscular trauma and inflammation, nociceptive pain is reproduced with abdominal muscle contraction. Treatment consists of rest,

nonsteroidal anti-inflammatory drugs (NSAIDs), and reassurance, as it resolves spontaneously in most cases.

Neuropathic pain occurs as a result of direct nerve damage or entrapment. It may present early or late, and it manifests as a localized, sharp, burning or tearing sensation. It may respond to pharmacologic therapy and to local steroid or anesthetic injections when indicated.

Visceral pain refers to pain conveyed through afferent autonomic pain fibers. It is usually poorly localized and may occur during ejaculation as a result of sympathetic plexus injury.

Chronic postoperative pain remains an important measure of clinical outcome that has been reported in as many as 63% of inguinal hernia repair cases.Meticulous nerve identification may prevent injury that results in debilitating chronic postoperative pain syndromes.

Post-herniorrhaphy inguinodynia is a debilitating chronic complication caused by a combination of nociceptive, neuropathic, and visceral elements. Its incidence is independent of the method of hernia repair; Treatment is based on repair technique, subsequent re-operations, pain character, and the presence of recurrence, meshoma, and fixation material. Selective ilioinguinal, iliohypogastric, and genitofemoral neurolysis or neurectomy, removal of mesh and fixation

material, and revision of the repair are common options for treatment. Nevertheless, anatomic variation and cross-innervation of the inguinal nerves in the retroperitoneum and inguinal canal make selective neurectomy less reliable.When inguinodynia is refractory to pharmacologic and interventional measures, triple neurectomy with removal of meshoma is arguably the most effective option for the majority of patients.Refractory inguinodynia with concurrent orchialgia also requires resection of the paravasal nerves.

Other chronic pain syndromes include **local nerve entrapment, meralgia paresthetica, and osteitis pubis.**

-At greatest risk of entrapment are the ilioinguinal and iliohypogastric nerves in anterior repairs and the genitofemoral and lateral femoral cutaneous nerves in laparoscopic repairs.

-Injury to the lateral femoral cutaneous nerve results in meralgia paresthetica, a condition characterized by persistent paresthesias of the lateral thigh. Initial treatment of nerve entrapment consists of rest, ice, NSAIDs, physical therapy, and possible local corticosteroid and anaesthetic injection.

- Osteitis pubis is characterized by inflammation of the pubic symphysis . Avoiding the pubic periosteum when placing sutures and tacks reduces the risk of developing osteitis pubis. CT scan or MRI excludes hernia recurrence, and bone

scan is confirmatory for the diagnosis. Initial treatment is identical to that of nerve entrapment; however, if pain remains intractable, orthopedic surgery consultation should be sought for possible bone resection and curettage. Irrespective of treatment, the condition often takes 6 months to resolve.

Cord and Testes Injury

Injury to spermatic cord structures may result in ischemic orchitis or testicular atrophy. Ischemic orchitis is likely caused by injury to the pampiniform plexus and not to the testicular artery. It usually manifests within 1 week of inguinal hernia repair as an enlarged, indurated, and painful testis, and it is almost certainly self-limited.

Injury to the testicular artery also may lead to testicular atrophy, which is manifest over a protracted period. Treatment for ischemic orchitis most frequently consists of reassurance, NSAIDs, and comfort measures. Intraoperatively, proximal ligation of large hernia sacs to avoid cord manipulation minimizes the risk of injury.

Injury to the vas deferens within the cord may lead to infertility. In open inguinal hernia repairs, isolating the vas deferens along with the cord structures using digital manipulation may cause injury or disruption. In laparoscopic approach, grasping the vas may result in a crush injury. Transections of the vas

deferens should be addressed with a urologic consult and early anastomosis, if possible.

In females, the round ligament is the analog to the spermatic cord, and it maintains uterine anteversion. Injury to the artery of the round ligament does not result in clinically significant morbidity.

LAPAROSCOPIC COMPLICATIONS:

In general, the risks of the TEP technique mirror those of open anterior repairs, as the peritoneal space is not violated. Complications of transabdominal laparoscopy include urinary retention, paralytic ileus, visceral injuries, vascular injuries, and less commonly, bowel obstruction, hypercapnia, gas embolism, and pneumothorax.

URINARY RETENTION

The most common cause of urinary retention after hernia repair is general anaesthesia, which is routine in laparoscopic hernia repairs. Other risk factors for postoperative urinary retention include pain, narcotic analgesia, and perioperative bladder distension.

Initial treatment of urinary retention requires decompression of the bladder with short term catheterization. Patients will generally require an overnight

admission and trial of normal voiding before discharge. Failure to void normally requires reinsertion of the catheter for up to a week.

ILEUS AND BOWEL OBSTRUCTION

The laparoscopic trans abdominal approach is associated with a higher incidence of ileus than other modes of repair. This complication is self-limited; however, it necessitates sustained inpatient observation, intravenous fluid maintenance, and possibly nasogastric decompression.

Abdominal imaging may be helpful to confirm the diagnosis and to exclude bowel obstruction. Prolonged absence of bowel function, in conjunction with a suspicious abdominal series, should raise concern for obstruction. In this case, CT of the abdomen is helpful to distinguish anatomic sites of obstruction, inflammation, and ischemia. In TAPP repairs, obstruction occurs most commonly secondary to herniation of bowel loops through peritoneal defects or large trocar insertion sites; however, the use of smaller trocars and the preponderance of TEP repairs have reduced the frequency of this complication. True obstruction warrants reoperation.

VISCERAL INJURY

Small bowel, colon, and bladder are at risk for injury in laparoscopic hernia repair. The presence of intra abdominal adhesions from previous surgeries may predispose to visceral injuries. Direct bowel injuries may also result from trocar placement.

In reoperative abdominal surgery, open Hasson technique and direct visualization of trocars are recommended to reduce the likelihood of visceral injury. Bowel injury may also occur secondary to electrocautery and instrument trauma outside of the camera field.

Bladder injuries are less common than visceral injuries, and they are usually associated with perioperative bladder distention or extensive dissection of perivesical adhesions. As with bladder injuries encountered in open surgery, cystotomies must be repaired in several layers with 1 to 2 weeks of Foley catheter decompression. A confirmatory cystogram may be performed before catheter removal to confirm healing of the injury.

VASCULAR INJURY

The most severe vascular injuries usually occur in **iliac or femoral vessels**, either by misplaced sutures in anterior repairs, or by trocar injury or direct dissection in laparoscopic repairs. In these cases, exsanguination may be swift. Conversion to an open approach may be necessary, and bleeding should be temporarily controlled with mechanical compression until vascular control is obtained.

The most commonly injured vessels in laparoscopic hernia repair include the inferior epigastrics and external iliacs. Although apparent upon initial approach, these vessels may be obscured during mesh positioning, and tacks or staples may injure them. Often, due to tamponade effect, injury to the inferior epigastric vessels is not apparent until the adjacent trocar is removed. If injured, the inferior epigastrics may be ligated with a percutaneous suture passer or endoscopic hemoclips.

If the tissue pressure exerted by pneumoperitoneum is greater than an injured vessel's hydrostatic intraluminal pressure, bleeding will not manifest until pneumoperitoneum is released. The presentation of an inferior epigastric vein injury is often delayed because of this effect, and it may result in a significant rectus sheath hematoma.

HEMATOMAS AND SEROMAS

Hematomas may present as localized collections or as diffuse bruising over the operative site. Injury to spermatic cord vessels may result in a scrotal hematoma. Hematomas may also develop in the incision, retroperitoneum, rectus sheath, and peritoneal cavity. The latter three sites are more frequently associated with laparoscopic repair. Bleeding within the peritoneum or preperitoneal space may not be readily apparent on physical examination. For this reason, close monitoring of subjective complaints, vital signs, urine output, and physical parameters is necessary.

Seromas are loculated fluid collections that most commonly develop within 1 week of synthetic mesh repairs. Large hernia sac remnants may fill with physiologic fluid and mimic seromas. Patients often mistake seromas for early recurrence. Treatment consists of reassurance and warm compression to accelerate resolution. To avoid secondary infection, seromas should not be aspirated unless they cause discomfort or they restrict activity for a prolonged time.

OBSERVATION AND RESULTS

COMORBIDITIES OF PATIENTS IN LAPAROSCOPIC VS LICHENSTEIN'S REPAIR

TABLE.1.Crosstab

			LAP	LIC	Total
			LAP	LIC	
COMORBIDITIES	BA	Count	0	1	1
		% within LAP LIC	0.0%	2.5%	1.3%
	COPD	Count	0	1	1
		% within LAP LIC	0.0%	2.5%	1.3%
	DM	Count	3	3	6
		% within LAP LIC	7.5%	7.5%	7.5%
	DM , B/L IH	Count	0	1	1
		% within LAP LIC	0.0%	2.5%	1.3%
	DM/SHT	Count	0	2	2
		% within LAP LIC	0.0%	5.0%	2.5%
	NIL	Count	32	27	59
		% within LAP LIC	80.0%	67.5%	73.8%
	SHT	Count	5	5	10
		% within LAP LIC	12.5%	12.5%	12.6%
Total		Count	40	40	80
		% within LAP LIC	100.0%	100.0%	100.0%

TABLE.2.Chi-Square Tests

		df	Asymp. Sig. (2-sided)
Pearson Chi-Square	6.535[a]	7	.479
Likelihood Ratio	8.853	Value	.263
N of Valid Cases	80		

a. 14 cells (87.5%) have expected count less than 5. The minimum expected count is .50.

TABLE.3.CO MORBIDITIES OF THE PATIENTS :

	LAPROSCOPIC REPAIR	LICHENSTEIN REPAIR
BA	0.0%	2.5%
COPD	0.0%	2.5%
DM	7.5%	7.5%
DM, B/L IH	0.0%	2.5%
DM, SHT	0.0%	5.0%
NIL	80.0%	67.5%
SHT	12.5%	12.5%

CHART.1. CO MORBIDITIES OF THE PATIENT.

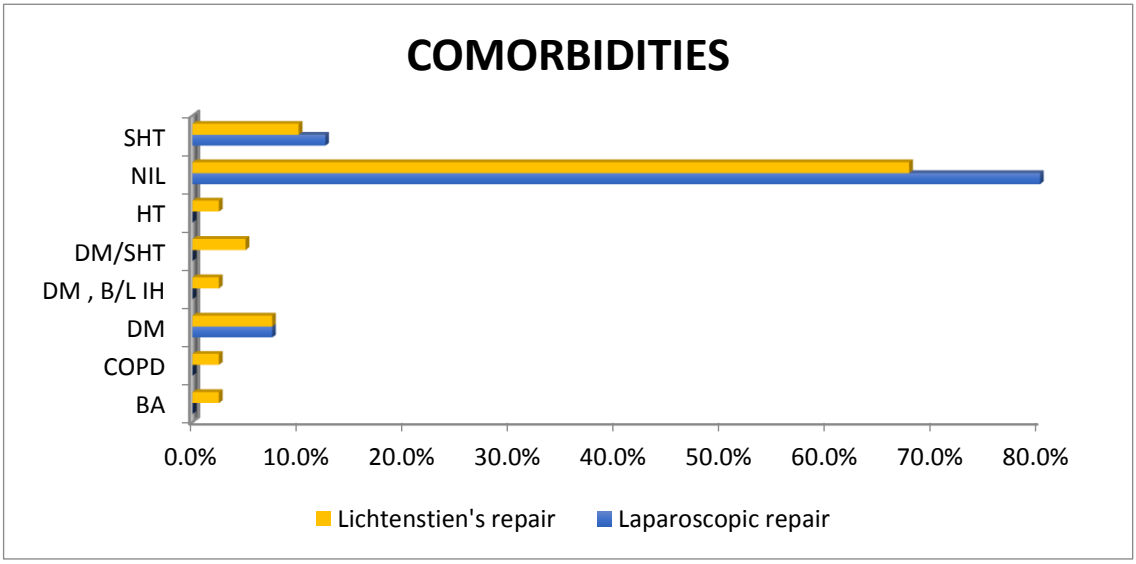


FIG-28. COMORBIDITIES OF PATIENTS UNDERGOING SURGERY

INTRA OPERATIVE COMPLICTIONS LAPAROSCOPIC VS LICHENSTEIN'S REPAIR

TABLE.4.Crosstab

			LAP	LIC	
			LAP	LIC	Total
INTRA OPERATIVE COMPLICTION	NIL	Count	40	38	78
		% within LAP LIC	100.0%	95.0%	97.5%
	VASCULAR INJ.	Count	0	2	2
		% within LAP LIC	0.0%	5.0%	2.5%
Total		Count	40	40	80
		% within LAP LIC	100.0%	100.0%	100.0%

TABLE.5.Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	2.051[a]	1	.152		
Continuity Correction[b]	.513	1	.474		
Likelihood Ratio	2.824	1	.093		
Fisher's Exact Test				.494	.247
No. of Valid Cases	80				

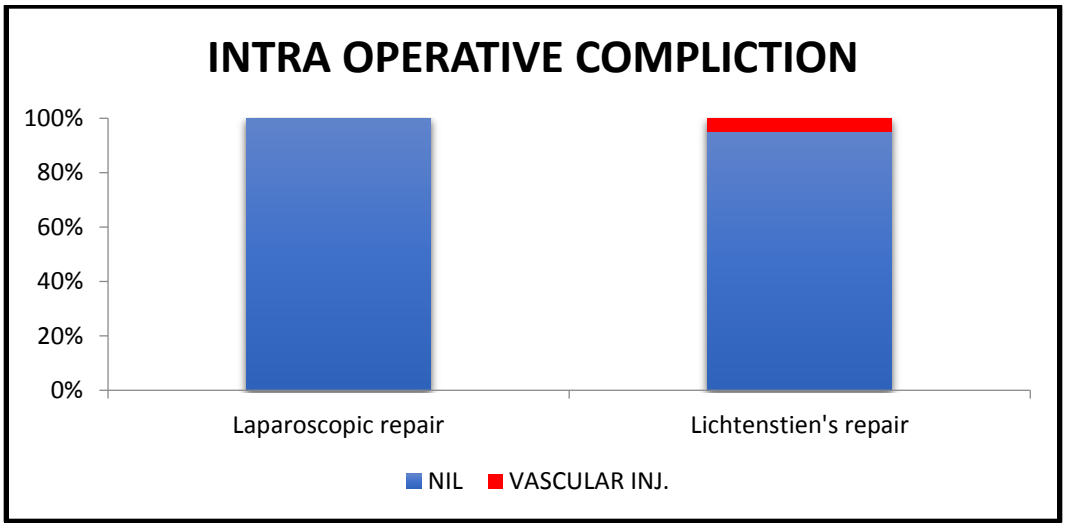
a. 2 cells (50.0%) have expected count less than 5. The minimum expected count is 1.00.

b. Computed only for a 2x2 table

TABLE.6. INTRA OPERATIVE COMPLICTIONS

	LAPAROSCOPIC REPAIR	LICHTENSTEIN'S REPAIR
NIL	100.0%	95.0%
VASCULAR INJ.	0.0%	5.0%

CHART.2INTRA OPERATIVE COMPLICTION



POST OPERATIVE COMPLICATIONS :LAPAROSCOPIC VS LICHENSTEIN'S REPAIR

TABLE.7.Crosstab

			LAP	LIC	Total
			LAP	LIC	
POST OPERATIVE COMPLICATION	NIL	Count	38	31	69
		% within LAP LIC	95.0%	77.5%	86.3%
	PSI	Count	1	0	1
		% within LAP LIC	2.5%	0.0%	1.3%
	SEROMA	Count	1	6	7
		% within LAP LIC	2.5%	15.0%	8.8%
	WOUND INFECTION	Count	0	3	3
		% within LAP LIC	0.0%	7.5%	3.8%
Total		Count	40	40	80
		% within LAP LIC	100.0%	100.0%	100.0%

TABLE.8.Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	8.282[a]	3	.041
Likelihood Ratio	10.219	3	.017
N of Valid Cases	80		

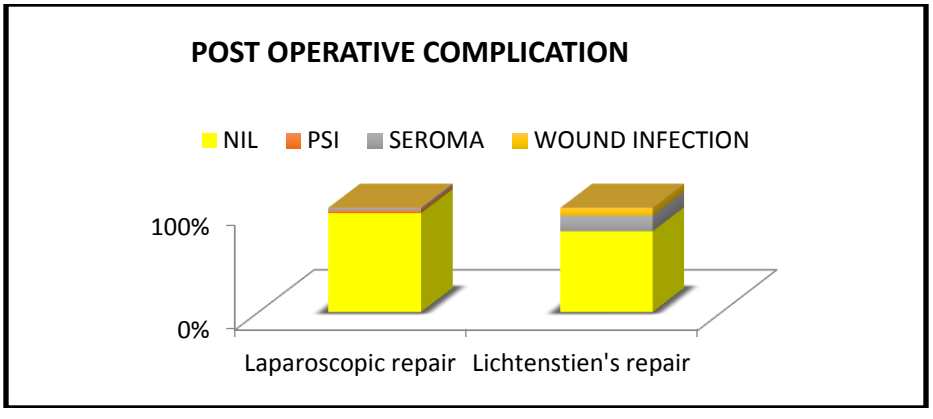
a. 6 cells (75.0%) have expected count less than 5. The minimum expected count is .50.

TABLE.9.POST OPERATIVE COMPLICATION

	LAPAROSCOPIC REPAIR	LICHTENSTEIN'S REPAIR
NIL	95.0%	77.5%
PSI	2.5%	0.0%
SEROMA	2.5%	15.0%
WOUND INFECTION	0.0%	7.5%

.

CHART.3POST OPERATIVE COMPLICATION



RECURRENCE : LAPAROSCOPIC VS LICHENSTEIN'S REPAIR

TABLE.10.Crosstab

			LAP	LIC	
			LAP	LIC	Total
RECURRENCE	NIL	Count	40	38	78
		% within LAP LIC	100.0%	95.0%	97.5%
	RECURRENCE	Count	0	2	2
		% within LAP LIC	0.0%	5.0%	2.5%
Total		Count	40	40	80
		% within LAP LIC	100.0%	100.0%	100.0%

TABLE.11.Chi-Square Tests

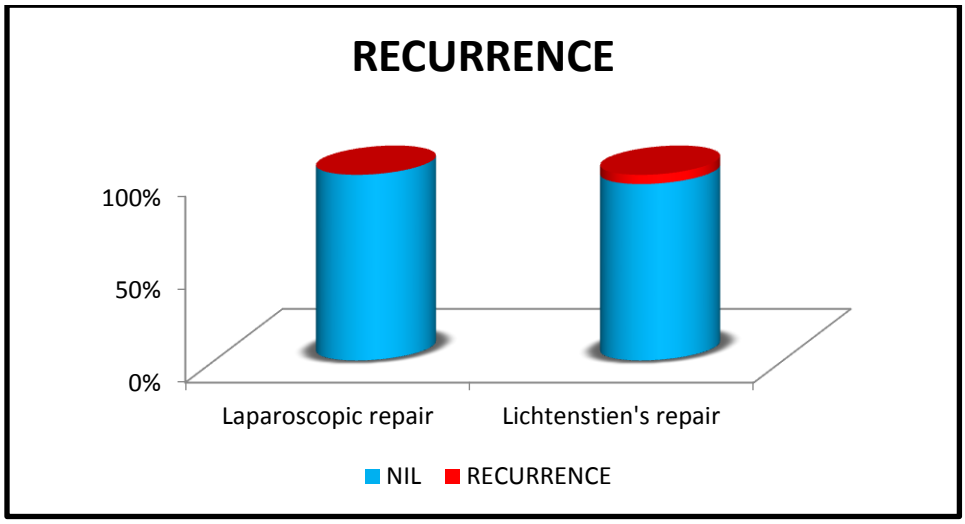
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	6.818[a]	2	.033
Likelihood Ratio	7.496	2	.024
N of Valid Cases	80		

a. 2 cells (33.3%) have expected count less than 5. The minimum expected count is .50.

TABLE.12.RECURRENCE

	LAPAROSCOPIC REPAIR	LICHTENSTEIN'S REPAIR	
NIL	100.0%	95.0%	
RECURRENCE	0.0%	5.0%	

CHART.4.RECURRENCE



POST OPERATIVE PAIN: LAPAROSCOPIC VS LICHENSTEIN'S REPAIR

TABLE.13.Crosstab

			LAP	LIC	
			LAP	LIC	Total
POP	+	Count	37	28	65
		% within LAP LIC	92.5%	70.0%	81.3%
	++	Count	3	11	14
		% within LAP LIC	7.5%	27.5%	17.5%
	+++	Count	0	1	1
		% within LAP LIC	0.0%	2.5%	1.3%
Total		Count	40	40	80
		% within LAP LIC	100.0%	100.0%	100.0%

TABLE.14.Chi-Square Tests

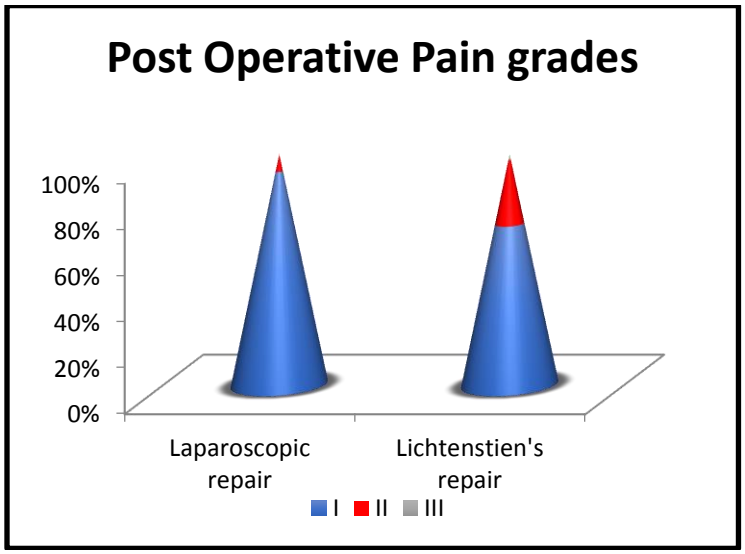
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	6.818[a]	2	.033
Likelihood Ratio	7.496	2	.024
N of Valid Cases	80		

a. 2 cells (33.3%) have expected count less than 5. The minimum expected count is .50.

TABLE.15.POST OPERATIVE PAIN

	LAPAROSCOPIC REPAIR	LICHTENSTEIN'S REPAIR
I	92.5%	70.0%
II	7.5%	27.5%
III	0.0%	2.5%

CHART.5.POST OPERATIVE PAIN



PATIENT FEED BACK : LAPAROSCOPIC VS LICHENSTEIN'S REPAIR

TABLE.16.Crosstab

			LAP	LIC	Total
			LAP	LIC	
PATIENT FEED BACK	GOOD	Count	38	35	73
		% within LAP LIC	95.0%	87.5%	91.3%
	POOR	Count	0	1	1
		% within LAP LIC	0.0%	2.5%	1.3%
	SATISFACTORY	Count	2	4	6
		% within LAP LIC	5.0%	10.0%	7.5%
Total		Count	40	40	80
		% within LAP LIC	100.0 %	100.0 %	100.0 %

TABLE.17.Chi-Square Tests

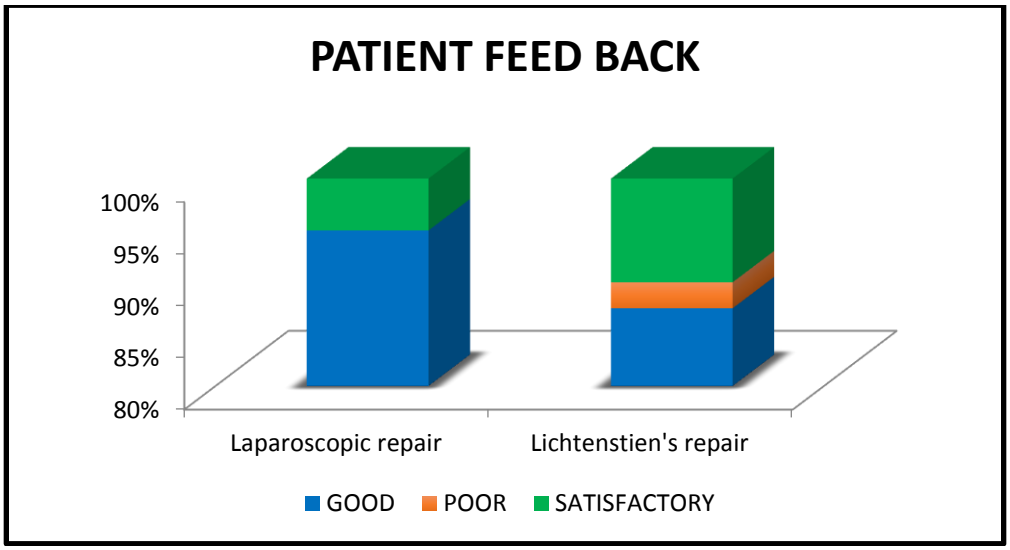
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	1.790[a]	2	0.409
Likelihood Ratio	2.189	2	0.335
N of Valid Cases	80		

a. 4 cells (66.7%) have expected count less than 5. The minimum expected count is .50.

TABLE.18.PATIENT FEED BACK

	LAPAROSCOPIC REPAIR	LICHTENSTEIN'S REPAIR
I	92.5%	70.0%
II	7.5%	27.5%
III	0.0%	2.5%

CHART.6.PATIENT FEED BACK



T-Test

TABLE.19.Group Statistics

LAP LIC		N	Mean	Std. Deviation	Std. Error Mean
AGE	LAP	40	40.95	13.958	2.207
	LIC	40	50.88	16.004	2.530
OPT	LAP	40	80.75	16.312	2.579
	LIC	40	51.08	13.256	2.096
DURATION OF STAY	LAP	40	3.73	1.176	.186
	LIC	40	7.10	1.892	.299
RETURN TO DAILY ACTIVITY	LAP	40	7.10	1.598	.253
	LIC	40	15.25	2.157	.341

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
AGE	Equal variances assumed	2.858	.095	-2.956	78	.004	-9.925	3.358	-16.609	-3.241
	Equal variances not assumed			-2.956	76.585	.004	-9.925	3.358	-16.611	-3.239
OPT	Equal variances assumed	5.452	.022	8.929	78	.000	29.675	3.323	23.059	36.291
	Equal variances not assumed			8.929	74.867	.000	29.675	3.323	23.054	36.296
DURATION OF STAY	Equal variances assumed	8.212	.005	-9.581	78	.000	-3.375	.352	-4.076	-2.674
	Equal variances not assumed			-9.581	65.236	.000	-3.375	.352	-4.078	-2.672
RETURN TO DAILY ACTIVITY	Equal variances assumed	5.580	.021	-19.199	78	.000	-8.150	.424	-8.995	-7.305
	Equal variances not assumed			-19.199	71.897	.000	-8.150	.424	-8.996	-7.304

TABLE.21.AGE DISTRIBUTION

	AGE (IN YEARS)
Laparoscopic Repair	41
Lichtenstein's Repair	51

CHART.7.AGE DISTRIBUTION

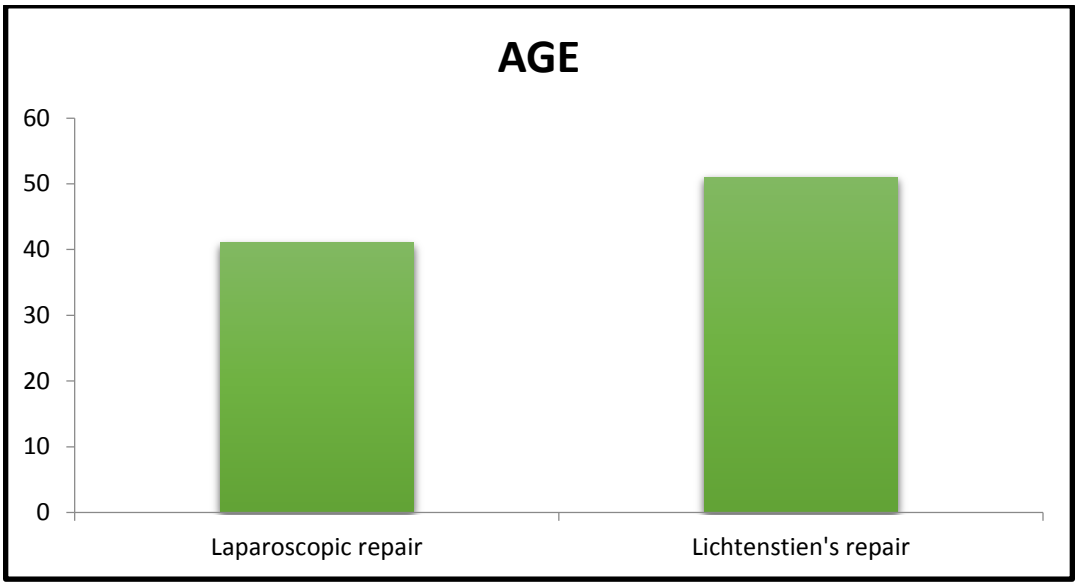


TABLE.22.**OPERATION PROCEDURE TIME**

	OPT (IN MINUTES)
Laparoscopic repair	81
Lichtenstein's repair	51

CHART.8.OPERATION PROCEDURE TIME

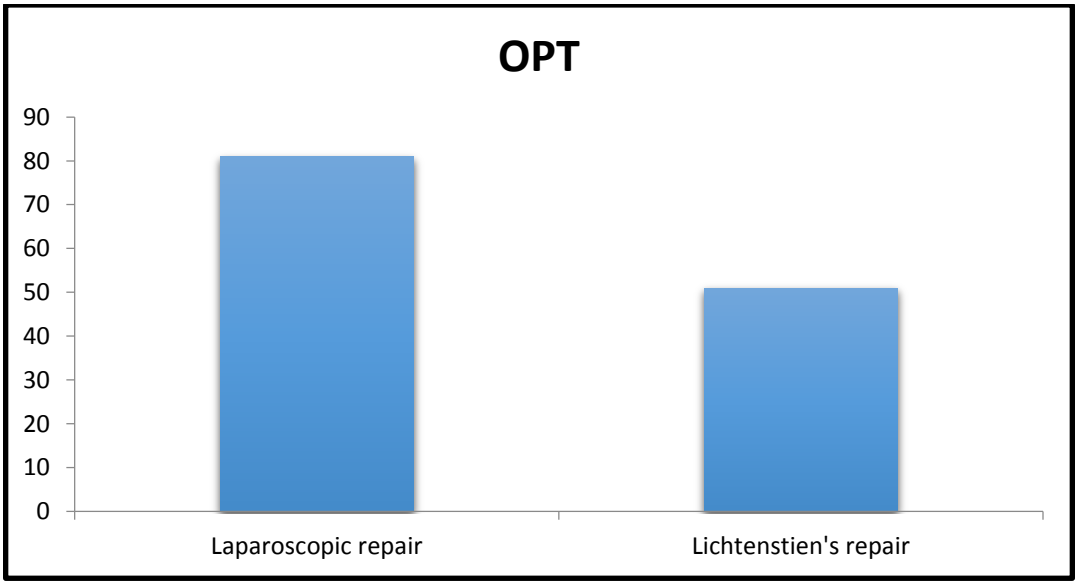


TABLE.23.DURATION OF STAY

	DURATION OF STAY (Days)
Laparoscopic repair	4
Lichtenstein's repair	7

CHART.9.DURATION OF STAY

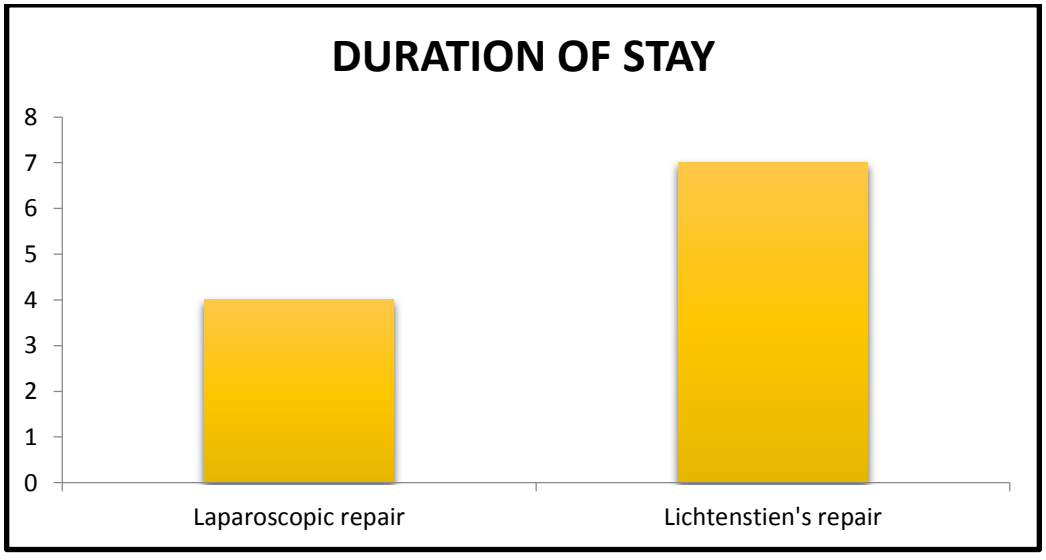
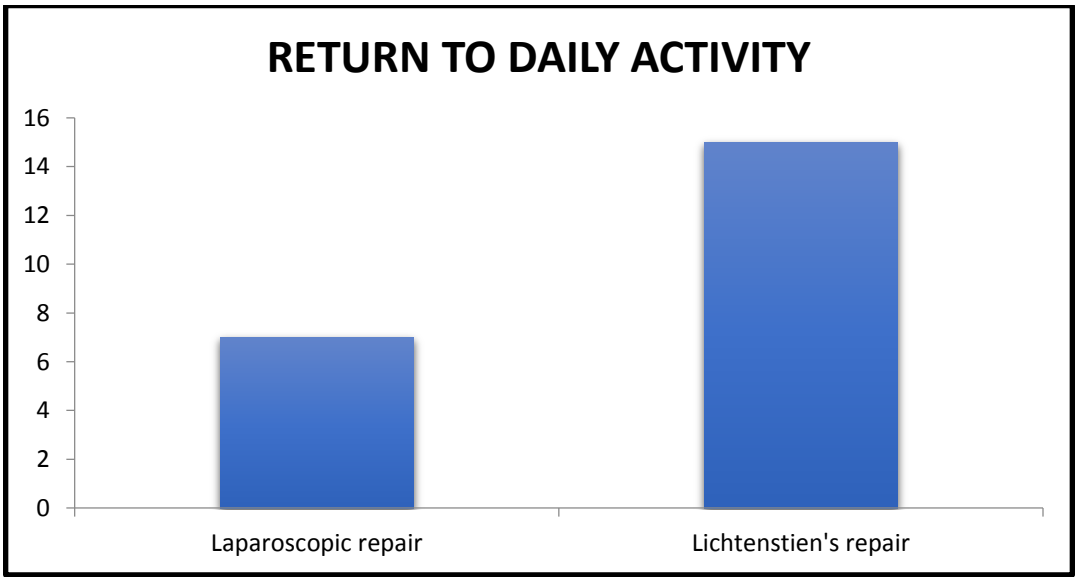


TABLE.24. RETURN TO DAILY ACTIVITY

	RETURN TO DAILY ACTIVITY (Days)
Laparoscopic repair	7
Lichtenstein's repair	15

CHART.10.RETURN TO DAILY ACTIVITY



DISCUSSION

DISCUSSION

I have studied 80 cases of inguinal hernia of which 40 patients were treated with Laparoscopic inguinal hernia mesh repair and 40 patients were treated with Lichtenstein's open inguinal hernia mesh repair. Collected information were analysed.

In my study for laparoscopic inguinal hernia mesh repair the youngest case reported was 18 years age and the oldest age reported was 60 years old and the mean age is 41.for Lichtenstein's inguinal hernia mesh repair the youngest case reported was 32 years age and the oldest age reported was 85 and the mean age was 51.

Out of 80 patient of inguinal hernia operated in our study ,all patients were male incidentally as inguinal hernias are more common among male patients.

In our study the duration of surgery (operation procedure time) was calculated for each patient at the time of surgery, the mean duration of surgery for laparoscopic inguinal hernia repair was 80 minutes and for Lichtenstein's inguinal hernia mesh repair was 51 minutes.

In our study the post operative pain in each group , laparoscopic inguinal hernia repair and Lichtenstein's inguinal hernia mesh repair was analysed through visual analogue scale and patient's complaints and inference was ,the post-

operative pain was more with Lichtenstein's inguinal hernia repair compared to laparoscopic inguinal hernia repair in spite of adequate analgesics.

Among 80 patients of inguinal hernia included in our study the duration of stay in hospital following surgery were calculated and found to be 4 days for laparoscopic repair and 7 days for Liechtenstein's open inguinal hernia repair.

In this comparative study including 80 patients of inguinal hernia operated , the mean days of return to daily activities was 7 days for laparoscopic inguinal hernia repair and for Liechtenstein's inguinal hernia repair it was 15 days.

Intraoperative complications were analysed in our study and 2 cases of vascular injury (1 inferior epigastria vessel –in scrotal abdomen case, 1 Pampniform plexus injury in huge hernia) in Liechtenstein's inguinal hernia repair and no intra operative complications with laparoscopic hernia repair.

Post operative complications for inguinal hernia repair were analysed in our study,

Liechtenstein's inguinal hernia mesh repair:

Seroma collection : 6 patients

Wound infection : 3 patients

Laparoscopic inguinal hernia repair:

Seroma collection : 1 patient

Port site infection : 1 patient.

In our study the patients were followed up periodically at regular intervals for 6 months and recurrence was found to be in 2 patients operated by Lichtenstein's repair and no recurrence with Laparoscopic inguinal hernia mesh repair.

This study was conducted in government hospital, so the expenditure towards meeting out the two different procedures could not be exactly calculated. In an average and approximation the cost expenditure for Laparoscopic inguinal hernia mesh repair was found to be more than Liechtenstein's inguinal hernia repair.

The learning curve of the surgeons for Laparoscopic inguinal hernia mesh repair was found to be more compared to Liechtenstein's repair.

In overall, in this comparative study the patient's feedback results were good with Laparoscopic inguinal hernia mesh repair compared to Liechtenstein's repair.

CONCLUSION

CONCLUSION

General conclusions :

It was not possible in our clinical setting to reproduce the good results reported by experts specialised in inguinal hernia centres with regard to cost effective analysis and learning curve.

Specific conclusions:

-The frequency of chronic pain reported by Lichtenstein group was as compared to laparoscopic repair on long term follow up.

-The short term results clearly favour laparoscopic repair regarding post-operative pain, sick leave and resumption of normal physical activities.

-The incidence of recurrent hernia, confirmed by clinical examination was low with laparoscopic repair as compared to Lichtenstein repair.

-No confirm conclusions about risk factors for chronic pain can be drawn with certainty from either group.

-Hospital cost for index operation and total cost including complications and recurrences, were higher for laparoscopic repair.

In general, Laparoscopic repair of inguinal hernia repair is associated with faster recovery , less pain, less post-operative complications better cosmetic result as compared to Lichtenstein repair.

BIBLIOGRAPHY

BIBLIOGRAPHY

1. Bailey and Love's Short practice of Surgery, 26th edition
2. Sabiston textbook of surgery, 20th edition
3. Schwartz's principles of surgery, 10th edition
4. Maingot's Abdominal Operation, 12th edition
5. A Manual on Clinical Surgery S.Das.
6. University ofGlasgow.Wright, David M. (2001) *Clinical studies comparing laparoscopic and open inguinal hernia repair*. MD thesis. http://theses.gla.ac.uk/5401/
7. Retrospective Study of Repair of Inguinal Hernia by Various Methods of Surgery Comparing their Results and rate of Complications in the Teaching Institute of South Gujarat..,

   Mukesh Pancholi*, Praveen Sharma*, G.R.Patel**.
8. Surgical options in inguinal hernia: Which is the best, Bhattacharjee, Prosanta Kumar JMAS.2006, 68[4]:191-200.
9. Ramakrishna HK IJS.2004; 66 P.249-250
10. Dr. R.K. Mishra., Complications of Laparoscopic Surgery. Current medical journal of India; VOL. X No. 3, June 2004.
11. Phillips, E.H., et al., *Incidence of complications following laparoscopic hernioplasty.* Surg Endosc, 1995. 9[1]: p. 16-21.

12. Felix, E., N. Harbertson, and S. Vartanian, *Laparoscopic hernioplasty.* Surg Endosc, .13 : p. 328-331.

13. Kumar, S., et al., *Chronic pain after laparoscopic and open mesh repair of groin hernia.* Br J Surg, 2002. 89[11]: p.1476-9.

14.Poobalan, A.S., et al., *A review of chronic pain after inguinalherniorrhaphy.* Clin J Pain, 2003. 19[1]: p. 48-54.

15. Wantz, G.E., Testicular atrophy and chronic residual neuralgia as risks of inguinal Hernioplasty. Surg Clin North Am, 1993.73: p. 571-81.

16. Pirski MI, Gacyk W, Witkowski P, Kostro J, Kot J. Mesh-plugoperation for treating inguinal hernia. Randomized studies [inPolish]. *Wiad Lek.* 1997; 50(suppl 1):391-395.

17. Zieran J, Zieren HU, Jacobi CA, Wenger FA, Muller JM.Prospective randomized study comparing laparoscopic andopen tension-free inguinal hernia repair with Shouldice's operation. *Am J Surg*. 1998; 175:330-333.

18.Snehal Fegade, R. K. Mishra. Laparoscopic versus open repairof inguinal hernia; current medical journal of India.

19.Leigh Neumayer, M.D., Anita Giobbie-Hurder, M.S., OlgaJonasson, M.D. et al; Open Mesh versus Laparoscopic MeshRepair of Inguinal Hernia; N Engl J Med 2004; 350:1819-1827April 29, 2004.

20. Eklund A, Montgomery A, Bergkvist L, et al. Chronic pain 5years after Randomized comparison of laparoscopic andLichtenstein inguinal hernia repair. Br J Surg. 2010 Apr; 97(4):600-8. *(Original)* PMID: 20186889

21.Anuradha Anand, Prom A. Sinha et al,Review of Inguinal hernia repair by various surgical techniques in a district general hospital in U.K.; Indian J Surg (January-February 2011) 73(1):13-18.

22. Laparoscopic Trans AbdominalPre-Peritoneal (TAPP)Repair of Inguinal Hernia A.K. Kriplani, Shyam S. Pachisia, Daipayan Ghosh

23.Laparoscopic Inguinal HerniaRepair—Tep Techniqu Pradeep K. Chowbey

24. Primatesta P, Goldacre MJ. Inguinal hernia repair; incidence ofelective and emergency surgery, readmission and mortality. Int J Epidemiol 1996; 25:835-9.

25.Bassini E: Sulla cura redicala dell'ernia inguinale .Arch Soc Ital Chir 1887;4: 380-388 quoted by Sakorafas GH, Halikias I,Nissotakis C,et al. Open tension free repair of inguinal hernias; The Lichtensteintechnique.BMC Surgery 2001;1:3-5

26.Glassow F. Short stay surgery (Shouldice technique) for repair ofinguinal hernia. Ann R Coll Surg Engl 1976 Mar; 58 (2): 133-9

27.Chiasson PM, Pace DE, Schlachta CM,et al. Minimally invasivesurgical practice: A survey of general surgeons in Ontario. Can JSurg 2004; 47:15-9.

28. Usher F, Cogan J, Lowry T. A new technique for the repair of inguinal and incisional hernias. Arch Surg 1960; 81: 187-194.

29. Stoppa R E, Rives J L, Warlaumont CR et al. The use of Dacron in the repair of hernias of the groin. Surg Clin North Am 1984;64:269-85.

30. Lichtenstein IL, Shulman AC, Amid PK, et al. The tension freehernioplasty. Am J Surg 1989; 157:188-93.

31. Netter's Surgical Anatomy and Approaches 1e
Conor P. Delaney, MD, MCh, PhD, FRCSI, FACS, FASCRS

32. Art of laparoscopic surgery textbook and atlas (vol 1 & vol 2)Author : C Palanivelu

PROFORMA

LAPAROSCOPIC MESH REPAIR OF INGUINAL HERNIA AND LICHTENSTEIN'S TENSION FREE MESH REPAIR OF INGUINAL HERNIA – A COMPARATIVE STUDY"

PROFORMA
CASE OF INGUINAL HERNIA

A. PATIENT PARTICULARS :
Name:
Address:

Age/sex:
RELIGION:
O.PNo:
I.P No:
D.O.A:
TIME & DATE OF OPERATION:
D.O.D:

B. CHIEF COMPLAINTS:
Duration of symptoms:

C.**PAST HISTORY:**

1. DM : Yes/ No
2. TB : Yes/ No
3. EPILEPSY
4. MALARIA
5. PREVIOUS SURGERY
6. JAUNDICE
7. CIRRHOSIS

D.**PERSONAL HISTORY:**
SMOKER
ALCOHOLIC

E.**INITIAL ASSESSMENT OF PATIENT :**
1.Vitals:

PR :
BP :
RR :

Temperature :

2.GENERAL SIGNS:

Pallor

Tongue

Skin

Icterus

Cyanosis

Lymphadenopathy:

K.SYSTEMIC EXAMINATION:

CVS

RS

CNS

Abdomen:

INGUINO SCROTAL REGION :

EXTERNAL GENITALIA:

PER RECTAL EXAMINATION :

CLINICAL DIAGNOSIS :

INVESTIGATIONS :

A. HB%

B. GROUPING & TYPING

C. BT/CT

D. PCV

E. HBSAG HIV

F. ECG

G. URINE: Macro

Micro
Albumin
Sugar

H. BLOOD:

RBS
BLOOD UREA
SER.CREATININE

I. CHEST X RAY PA VIEW

J. X-RAY ABDOMEN ERECT

K. ABDOMEN & PELVIS USG :

L.PULMONARY FUNCTION TEST:

M.2D ECHOCARDIOGRAPHY :

CONSENT FORM

STUDY TITLE:

"**LAPAROSCOPIC MESH REPAIR OF INGUINAL HERNIA AND LICHTENSTEIN'S TENSION FREE MESH REPAIR OF INGUINAL HERNIA – A COMPARITIVE STUDY"**

Department of General surgery, GMKMCH

PARTICIPANT NAME: AGE : SEX:

I.P. NO:

I confirm that I have understood the purpose of surgical/invasive procedure for the above study. I have the opportunity to ask the question and all my questions and doubts have been answered to my satisfaction.

I have been explained about the possible complications that may occur during and after medical/ surgical procedure. I understand that my participation in the study is voluntary and that I am free to withdraw at any time without giving any reason.

I understand that investigator, regulatory authorities and the ethics committee will not need my permission to look at my health records both in respect to the current study and any further research that may be conducted in relation to it, even if I withdraw from the study. I understand that my identity will not be revealed in any information released to third parties or published, unless as required under the law. I agree not to restrict the use of any data or results that arise from the study.

I hereby consent to participate in this study for various surgical/invasive procedures and their outcomes.

Time :

Date : Signature / Thumb Impression Of Patient

Place :

Patient's name:

Signature of the investigator: _____

Name of the investigator : _____

MASTER CHART-LAPROSCOPIC MESH REPAIR OF INGUINAL HERNIA

S.NO	NAME	AGE	SEX	COMORBIDITY	OPT	INTRAOPERATIVE COMPLICATION	POSTOPERATIVE COMPLICATION	DURATION OF STAY : IN DAYS	RETURN TO DAILY WORK : IN DAYS	RECURRENCE	POP	PATIENT FEED BACK
1.	ARJUNAN	45	M	NIL	80	NIL	NIL	3	5	NIL	+	GOOD
2.	ANNAMALAI	60	M	NIL	105	NIL	NIL	2	5	NIL	+	GOOD
3.	TAMILSELVAN	18	M	NIL	95	NIL	NIL	3	6	NIL	+	GOOD
4.	KRISHNARAJ	20	M	NIL	90	NIL	NIL	2	6	NIL	+	GOOD
5.	MANIKANDAN	27	M	NIL	85	NIL	NIL	3	6	NIL	+	GOOD
6.	THANGADURAI	25	M	NIL	105	NIL	NIL	4	5	NIL	+	GOOD
7.	ABITH	60	M	SHT	105	NIL	NIL	5	8	NIL	+	GOOD
8.	GNANARAJ	20	M	NIL	85	NIL	NIL	3	5	NIL	+	GOOD
9.	GUNASEKAR	21	M	NIL	95	NIL	NIL	3	7	NIL	+	GOOD
10.	MUNAVAR	38	M	NIL	105	NIL	PSI	7	10	NIL	+	SATISFACTORY
11.	SENTHIL	33	M	NIL	80	NIL	NIL	3	5	NIL	+	GOOD
12.	KANNAN	46	M	SHT	95	NIL	NIL	4	8	NIL	++	GOOD
13.	PALANISAMY	40	M	NIL	100	NIL	NIL	4	7	NIL	+	GOOD
14.	AMMASI	40	M	NIL	105	NIL	NIL	3	6	NIL	+	GOOD
15.	AYYAKANNU	23	M	NIL	90	NIL	NIL	3	7	NIL	+	GOOD
16.	PALANI	52	M	NIL	85	NIL	NIL	4	8	NIL	+	GOOD
17.	MUTHU	60	M	DM	100	NIL	NIL	5	9	NIL	+	GOOD
18.	MOHAN	18	M	NIL	90	NIL	NIL	3	7	NIL	+	GOOD
19.	MOHAN	46	M	NIL	95	NIL	NIL	5	8	NIL	+	GOOD
20.	RAMACHANDRAN	48	M	DM	80	NIL	NIL	4	7	NIL	+	GOOD
21.	JEYAVEL	49	M	NIL	80	NIL	NIL	3	6	NIL	+	GOOD

22.	MUTHU	45	M	SHT	75	NIL	NIL	3	6	NIL	+	GOOD
23.	MANIKANDAN	27	M	NIL	70	NIL	NIL	3	7	NIL	+	GOOD
24.	NATESAN	55	M	NIL	75	NIL	NIL	4	8	NIL	++	GOOD
25.	GOPAL	54	M	NIL	100	NIL	NIL	4	7	NIL	+	GOOD
26.	KUMAR	44	M	NIL	80	NIL	SEROMA	8	14	NIL	++	SATISFACTORY
27.	SAKTHIVEL	50	M	NIL	50	NIL	NIL	3	7	NIL	+	GOOD
28.	JEYAPRAKASAM	47	M	NIL	60	NIL	NIL	4	7	NIL	+	GOOD
29.	KARUPANNAN	55	M	SHT	55	NIL	NIL	3	7	NIL	+	GOOD
30.	SHAFI	25	M	NIL	60	NIL	NIL	3	7	NIL	+	GOOD
31.	PERUMAL	35	M	NIL	65	NIL	NIL	4	8	NIL	+	GOOD
32.	MURUGAN	51	M	NIL	60	NIL	NIL	4	7	NIL	+	GOOD
33.	RAMALINGAM	55	M	NIL	65	NIL	NIL	5	8	NIL	+	GOOD
34.	KARTHIKEYAN	50	M	SHT	70	NIL	NIL	4	7	NIL	+	GOOD
35.	RAJA	45	M	NIL	70	NIL	NIL	3	7	NIL	+	GOOD
36.	RANJITH	29	M	NIL	60	NIL	NIL	3	6	NIL	+	GOOD
37.	RAJA	29	M	NIL	65	NIL	NIL	3	7	NIL	+	GOOD
38.	CHINNASAMY	42	M	NIL	65	NIL	NIL	4	7	NIL	+	GOOD
39.	SARAVANNAN	38	M	NIL	60	NIL	NIL	3	7	NIL	+	GOOD
40.	SOUNDARAJAN	60	M	DM	75	NIL	NIL	5	9	NIL	+	GOOD

MASTER CHART-LICHTENSTEIN'S TENSION FREE MESH REPAIR OF INGUINAL HERNIA

S.NO	NAME	AGE	SEX	COMORBIDITY	OPT	INTRAOPERATIVE COMPLICATION	POSTOPERATIVE COMPLICATION	DURATION OF STAY : IN DAYS	RETURN TO DAILY WORK : IN DAYS	RECURRENCE	POP	PATIENT FEEDBACK
1.	SRINIVASAN	55	M	SHT	50	VASCULAR INJURY	SEROMA	10	18	NIL	++	SATISFACTORY
2.	THANGAVEL	35	M	NIL	35	NIL	NIL	7	13	NIL	+	GOOD
3.	ARUMUGAM	55	M	DM,B/L IH	85	NIL	NIL	9	18	NIL	+	GOOD
4.	THAMBI	43	M	NIL	43	NIL	WOUND INFECTION	11	15	NIL	+	GOOD
5.	VAITHILINGAM	59	M	COPD	50	NIL	NIL	8	13	NIL	+	GOOD
6.	RANGASAMY	39	M	NIL	45	NIL	NIL	6	15	NIL	++	GOOD
7.	KALIPERUMAL	58	M	NIL	75	NIL	NIL	8	17	NIL	+	GOOD
8.	PERUMAL	60	M	NIL	40	NIL	SEROMA	10	18	NIL	+	GOOD
9.	VENKATAN	57	M	DM	45	NIL	NIL	6	14	NIL	++	SATISFACTORY
10.	NAGARAJ	32	M	NIL	50	NIL	NIL	6	13	NIL	+	GOOD
11.	DANAPAL	60	M	NIL	40	NIL	NIL	6	12	NIL	+	GOOD
12.	DURAISAMY	60	M	NIL	45	NIL	NIL	8	16	NIL	+	GOOD
13.	MURALI	41	M	DM	65	NIL	WOUND INFECTION	11	20	NIL	+	GOOD
14.	PALANISAMY	43	M	NIL	40	NIL	NIL	6	12	NIL	+	GOOD
15.	NAGAPPAN	60	M	SHT	45	NIL	NIL	5	15	NIL	+	GOOD
16.	SANGUBALAN	35	M	NIL	55	NIL	SEROMA	11	21	NIL	+	GOOD
17.	CHELLAMUTHU	59	M	NIL	45	NIL	NIL	6	15	NIL	++	GOOD
18.	SENTHIL	30	M	NIL	40	NIL	NIL	5	12	NIL	+	GOOD
19.	SELVAM	32	M	NIL	50	NIL	NIL	5	16	NIL	+	GOOD
20.	RAJU	46	M	NIL	55	NIL	NIL	6	14	NIL	+	GOOD
21.	PERUMAL	58	M	SHT/DM	45	NIL	SEROMA	9	18	NIL	++	SATISFACTORY
22.	PERUMAL	60	M	NIL	55	NIL	WOUND INFECTION	12	19	RECURRENCE	++	SATISFACTORY

23.	DEVA	21	M	NIL	40	NIL	NIL	6	14	NIL	++	GOOD
24.	KRISHNAMOORTHY	59	M	SHT	45	NIL	NIL	7	16	NIL	+	GOOD
25.	RAJENDRAN	47	M	NIL	50	NIL	NIL	6	15	NIL	+	GOOD
26.	SEETHARAM	31	M	NIL	45	VASCULAR INJURY	NIL	6	14	NIL	+	GOOD
27.	RAMACHANDRAN	46	M	DM/SHT	40	NIL	SEROMA	7	17	NIL	+	GOOD
28.	CHINNATHAMBI	54	M	NIL	60	NIL	NIL	6	14	NIL	++	GOOD
29.	AYYANDURAI	40	M	BA	45	NIL	NIL	7	15	NIL	+	GOOD
30.	PERIYASAMY	60	M	SHT	50	NIL	NIL	6	15	NIL	+	GOOD
31.	MANI	40	M	NIL	40	NIL	NIL	6	14	NIL	+	GOOD
32.	KUMAR	38	M	NIL	45	NIL	NIL	5	13	NIL	+	GOOD
33.	SAKTHIVEL	32	M	NIL	45	NIL	NIL	6	15	NIL	++	GOOD
34.	RAJARAM	37	M	NIL	50	NIL	NIL	7	13	NIL	++	GOOD
35.	SUBRAMANI	49	M	NIL	85	NIL	SEROMA	8	17	NIL	+	GOOD
36.	VENKATACHALAM	59	M	NIL	65	NIL	NIL	6	15	NIL	+	GOOD
37.	RAJA	33	M	NIL	55	NIL	NIL	6	15	NIL	++	GOOD
38.	SIVASAKTHI	42	M	NIL	50	NIL	NIL	6	14	NIL	+	GOOD
39.	GOVINDHAN	58	M	DM	45	NIL	NIL	5	14	NIL	+	GOOD
40.	AYYANAR	59	M	SHT	95	NIL	NIL	7	16	RECURRENCE	+++	POOR

MASTER CHART – ABBREVATIONS

1. OPT : Operation procedure time.
2. PSI : Port site infection.
3. Intra operative complications :

    -Bowel injury

    -Vascular injury

    -Injury to spermatic cord

    -Bladder injury

4. Post operative complications :

    -Bleeding

    -Seroma / Hematoma

    -Wound infection

    -Mesh infection

    -Neuropathic pain

5. POP : Post operative pain